MODERN ARCHERY

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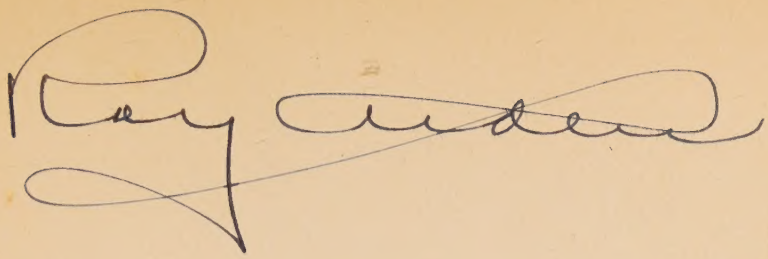

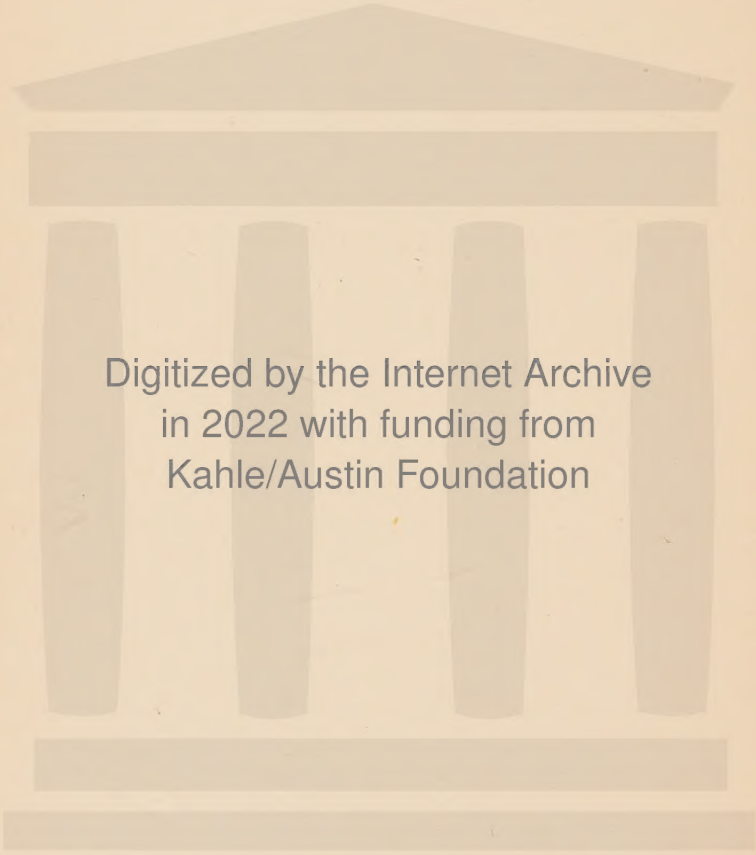
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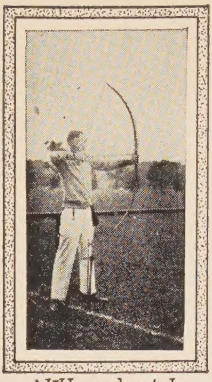

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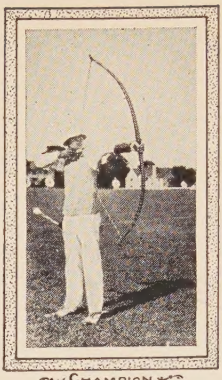

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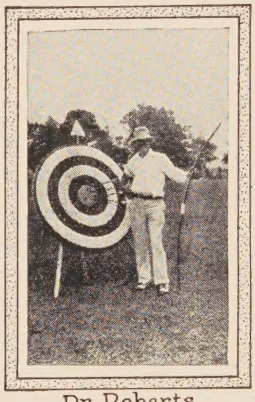

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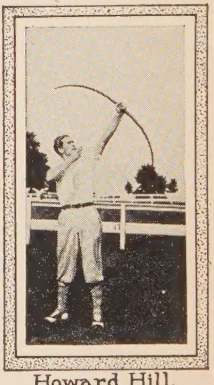

Howard Hill.
MIAMI, FLA.
WINNER FLIGHT SHOOT.

Modern Archery

A TEXT BOOK ON THE
ART OF SHOOTING
FOR ACCURACY WITH THE
BOW AND ARROW

BY

ARTHUR·W·LAMBERT, JR., B.S.

CHAMPION

MID WEST ARCHERY ASSOCIATION OF THE
UNITED STATES, 1927

ILLUSTRATED

with photographs and drawings by the Author

New York

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To

LOUIS C. SMITH

WHOSE UNTIRING EFFORTS FOR MANY YEARS AS SECRETARY-TREASURER OF THE NATIONAL ARCHERY ASSOCIATION OF THE UNITED STATES MADE MODERN ARCHERY POSSIBLE, WE DEDICATE THIS VOLUME.

THE AUTHOR

PREFACE

Archery is an old subject.

Yet comparatively little that is of practical interest to the archer himself has been written.

There has been little that the beginner could understand, particularly one who wished to delve below the immediate surface and learn something of the fundamentals of accurate and consistent shooting.

In the past literature of the bow and arrow has been largely historical, romantic or poetic.

The reason for this paucity of material is probably best explained in the words of Roger Ascham, who wrote *"Toxophilus,"* the first great book on "ye art of shootynge with ye bowe and arrows." He said: "Men that used shooting most, and knew it best, were not learned; men that were learned used little shooting, and were ignorant in the nature of the thing, and so few men hath been that hitherto were able to write upon it."

Now in Roger Ascham's day and age, which was contemporaneous with Queen Elizabeth, "learned" meant simply the ability to read and write in the common language, rather than in the sense that we employ the word to-day.

The present writer, having fair ability to make himself understood and being somewhat proficient in shooting with the bow and arrow, undertook the work at hand in an attempt to place in the hands of enthusiastic archers of to-day a text-book that would guide both novice and student to a better understanding of the principles that underlie the art of shooting accurately with the ancient weapon.

This work is devoted entirely to target shooting, in which accuracy as reflected in scores made at the regulation rounds is the sole aim.

Opinions in regard to shooting methods vary greatly and opinions concerning the details of material and construction run a wide gamut. However, there are certain definite principles that

are axiomatic or nearly so, and these form the foundation of scientific archery. In general, however, the facts are elusive. The border line between the scientific and the moot is by no means definite.

Shooting with the bow and arrow is a mental as well as mechanical or physical performance.

Archery is a temperamental sport, almost feminine in its caprices. Its fascinating charm and hold on the imagination is largely explained in its whims and subtleties.

In venturing opinions of his own the present writer does not always presume to proclaim them as final. They are offered mainly as expositions of technique or policy that he has developed and tried out himself. His published scores, as they have appeared in the *Bulletin* of the National Archery Association of the United States, which were made by following these precepts, constitute his chief authority for statements made and methods advocated.

In the beginning we followed the advice and teachings of others, so far as we could obtain them. Later we adopted, adapted, innovated or rejected as our judgment saw fit. And we are by no means through with the process!

We firmly believe in the policy that *results* and *results alone* count!

The score is the final tribunal. If a higher score can be attained by reversing some preconceived notion, we do not hesitate to reverse that notion.

Archery traditions are deeply rooted. They are the crystallization of years of common experience, and should not be lightly cast aside. Yet no one should hesitate to depart from the oldest of these if the departure is justified in consistent higher totals.

We have copied no writer, although we have used what knowledge we had of others. We made little use of quotation marks, but acknowledge borrowing.

However, since little or nothing can justly be claimed as original by any writer on this—one of the oldest subjects known to man—any "plagiarism" resolves itself mainly to the use of common property.

We have written in the archer's language, but have caused new words, or old words with particular archery meanings, to be set in different type, both to call special attention to them and to indicate that the context should be digested to get the particular meaning.

Without regard to sources we have tried herein to compile a volume of useful and authoritative information, assembled in an interesting and understandable manner. We have tried to accompany every assertion with a lucid reason, particularly where our own personal opinion differs from that of others; and trust that the archers who are interested in more or less degree in the fascinating recreations made possible by the long-bow and clothyard shaft will profit by making higher scores and obtain added interest in the game.

ARTHUR W. LAMBERT, JR.

March, 1929.

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CHAPTER I

ARCHERY AS A SPORT

In pursuing recreation man turns instinctively to implements of warfare and the chase for inspiration. It is therefore natural that he should adapt projective weapons for sport.

Before firearms came into extensive use shooting with the bow-and-arrow was a serious business. Proficiency in its use assured food and clothing in peacetimes, safety and success in time of war. Archery practice began in early youth and was encouraged and continued throughout the active life of men.

The bow-and-arrow is one of the oldest implements known. With the exception of fire it did more than any other single agency to elevate mankind above the beast. It proved his first means of striking effectively from a distance.

In ancient eras the development of archery paralleled the continued perfection of modern guns. To outrange and outhit an enemy was the foremost incentive, just as it is to-day with modern artillery practice and design.

The possession of better bows-and-arrows gave different peoples an advantage over others less efficiently armed; and individual skill in the use of weapons of equal efficiencies gave certain nations the upper hand over others. In fact nations came into being and thrived largely in proportion to their relative proficiency with the best procurable weapons. The British Empire would be non-existent but for the longbow and clothyard shaft. In the skilled hands of English yeomen it did terrible execution against the enemy. The longbow was the machine-gun of that day.

The story of the bow-and-arrow has been recorded in many languages. It is a glorious story. Its invention, however, has been lost in antiquity. Since time immemorial the bow-and-arrow has been the faithful companion of man. Its employment was practically universal. Aboriginal tribes in the depths of jungles, Esquimaux within the Arctic Circle, Tartars, Turks, Egyptians, Greeks, Romans, Hebrews, American Indians, and comparatively

modern Europeans—all used the bow-and-arrow. Little wonder that the bow exerts an uncanny fascination for the average individual!

The wheel-and-axle is the simplest and most useful of all mechanical devices; yet the bow-and-arrow, a far more complicated contrivance, is ages older. Savages seldom, if ever, put their conveyances on wheels. The highly intelligent and ever moving American Indian used the travail, employing dragging rather than rolling methods for heavy transportation. Yet the use of the bow-and-arrow, even amongst the most aboriginal tribes, was practically universal.

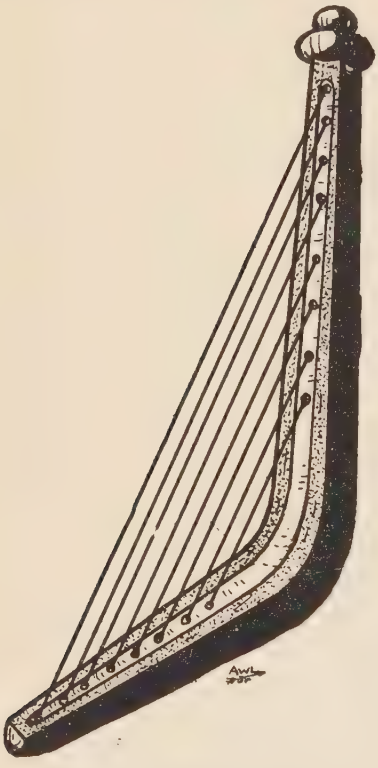


FIG. 1. THE HARP OF DAVID

As the revolving disk can be considered the ultimate ancestor of modern transportation, so the bow-and-arrow may be recognised as the first parent of all stringed instruments, perhaps even of music itself. The pleasing twang of a taut bowstring when tapped with an arrow or plucked with the finger most probably first suggested mechanically produced sounds of musical pitch to the human ear. Certainly the harp of David (*Figure* 1) was little more than an extremely bent bow fitted with several strings. This idea is seen perfected in the modern harp and glorified in the pianoforte. The Steinway is but a lineal descendant of the prehistoric weapon.

Since no other implement so holds the affection or grips the imagination, it is hard to write of the bow-and-arrow without yielding to the temptation to speculate or philosophise; but it is not within the province of this book to do much of either. Other works deal better with such phases of the subject. We propose, instead, to treat of archery herein mainly as a basis for modern recreation. The brief historical sketches that we

shall permit ourselves to indulge in will be given only to serve as a fitting background for a better understanding of the character and use of modern tackle. We propose to deal mainly with modern archery as indulged in by the leading exponents of the game—to-day, particularly, as it has been sponsored and developed by its governing body in this country, *The National Archery Association of the United States.*

Within the last few years the bow-and-arrow has gained immensely in popularity, both for hunting and target shooting. Though closely related in fundamentals, however, these two divisions are separate and distinct branches of the sport. Each is governed by its own technique.

The underlying principles of hunting with the bow-and-arrow have been ably expounded by such capable writers as Maurice Thompson, Saxton Pope and Arthur Young.

Few archers, however, actually ever go in search of game—compared to the thousands and tens of thousands who seek some form of interesting and available recreation to benefit their leisure moments close at home. It is for these that this book is expressly written. The term "Archery" to-day is generally applied to target-shooting, and it is in this sense that we shall use it in this treatise.

"Our ancestors," to paraphrase an old writer, "used the bow, with which they defended their country, vanquished their enemies, succoured their friends, enlarged their dominions, advanced their religion, and made their names fearful to the present age, and their fame everlasting to those that ensue."

With such a heritage of history and tradition, is it to be marvelled that the bow-and-arrow should serve as the implement for a most fascinating modern sport? Except for a few minor refinements modern archery is the archery of the longbow and clothyard shaft—the same old archery of Robin Hood backed with cherished additional traditions of William-the-Conqueror, Agincourt, Crécy and other allied influences.

Yet we have better bows to-day, use finer arrows, and have a better understanding of the art of accurate shooting than did our ancestors or even the most celebrated archers of antiquity.

Many cherished illusions regarding ancient prowess will no doubt be dispelled in subsequent chapters. But to the thinking mind there will be no loss for wonderment.

Although the extraordinary performances credited to our an-

cestors and the marvellous feats reported of savage archery fail to hold water in the light of modern reason, the true facts need little polishing. The actual possibilities of the simple weapons are astounding, and the reliable accuracy that is possible is positively uncanny.

The novice will soon appreciate this, once he has learned to handle the bow-and-arrow and shoot the popular *rounds*. He will not have to refer to supposed performances of the ancients for inspiration, since the high scores made to-day by leading exponents of the game will so dwarf his own best efforts as to make the ability of the modern expert appear incredulous.

CHAPTER II

ANCIENT, INDIAN, AND ENGLISH ARCHERY

The first consideration of an archer is, naturally, the bow. In its simplest form it is merely a length of some elastic material, bent and held in a crescent-like shape by a somewhat shorter length of cord, attached to its extremities.

When the middle is held in one hand and the string is drawn away from the handle by the other, potential energy is stored in the constrained fibres of the bow. When the string is released the tendency of the bent limbs to assume their original position straightens the cord with considerable quickness and force; and this action is used to propel a second stick called the arrow.

FIG. 2. GRÆCIAN BOW AND ARROW

Bows have been made of many and varied materials. The simplest bow is made from a single stick of wood, perhaps a length of sapling or the limb of a tree.

In many lands suitable wood for bows was not readily obtainable; therefore other materials of proper elastic qualities were resorted to, either alone or in combination with others. The Esquimaux, for example, found only driftwood—a brittle, inefficient material indeed. But he partially compensated for this defect by making weak bows, which be wrapped with hide and sinew for protection.

The Greeks are said to have made their bows from horns of the "mountain goat." Two symmetrical horns were united to a rigid centre piece, the handle, and scraped till the bending was right (*Figure* 2). The characteristic Greek genius for beauty inspired her bowyers; for their pattern has always remained the classic symbol, the weapon of Diana and Cupid.

COMPOSITE BOWS

The composite bow of the Asiatics was fabricated of wood, horn, glue and sinews. When unstrung, instead of assuming a straightened condition, these bows actually reversed themselves to form a letter "C" (*Figure* 3). The short Turkish bow, a composite, was the most efficient weapon. Bending almost double under a terrific strain without breaking and shooting a very light arrow, these bows hold the known distance records for flight shooting (see *Page* 278).

FIG. 3. ORIENTAL BOW—UNSTRUNG AND STRUNG

The ancient Assyrians, according to the prevailing type of bow depicted in their art, used a curious short bow that was marked by a peculiar angular shape at the handle. They were supposed by previous writers to have been made of single staves of wood. If so they bent exceedingly in the handle when drawn—a great fault in bows as we know them to-day. We have long ventured the opinion, however, that they were merely short, strong wooden bows, which were composed of *two* separate limbs joined *rigidly* at the handle, after the fashion of the familiar jointed, or take-apart, bow of to-day. However, these bows were evidently joined at a severe backward angle, to reduce the bending of the limbs necessary to merely brace or string the bow. This construction made "high-stringing" possible which permitted the use of long arrows and thus enabled the archer to use a fairly scientific method of aiming, impossible with the shorter arrow.

This explanation is purely speculative, yet the drawn bow in the hands of the Assyrian archer depicted in *Figure* 4 bears out this supposition.

Mr. T. Merriman of New York constructed a bow of this type

with which he entered the flight shoot at the 1928 National Tournament. Two short limbs were held together by an angular

FIG. 4. ASSYRIAN ARCHER WITH SHORT ANGULAR BOW

handle of steel tubing. An actual draw of about eight inches sent an arrow more than two hundred yards.

We have long cherished the idea of making such a bow to determine the feasibility of securing a short bow capable of with-

standing the long draw demanded by present day aiming technique, the idea being to take advantage of the quick cast of the short bow without the danger of breaking through overdraw. The innovation, however, will no doubt prove a disappointment; for, from an engineering standpoint, it appears that the resolution of the forces acting at the ends of the bow is such that any gain from the quicker casting power of the shorter limb would be lost in a reduction of the forward propelling component of the tips.

THE COMING OF FIREARMS

The bow-and-arrow as a weapon of importance was obsolescent at the time of the discovery of America. The army of Ferdinand and Isabella used ordnance in its conquest of the Moors. A year before Columbus sailed to discover the new world Granada fell; and in their operations against the Moorish capital the Spaniards made special roads over the mountains for the passage of their guns. In the conquest of Mexico Cortez employed the arquebuse when he subdued the empire of Montezuma with a mere handful of men. In the conquest of Peru, a few years later, Pizarro "swept the Indians down, as the latter rushed forward in a confused mass to the assault, by the volleys of musketry."

By 1600 bows-and-arrows were definitely obsolete. When the early settlers founded Jamestown they were no longer used as weapons of importance by the white man. The Pilgrim went to church with his blunderbuss and relied on that weapon both for protection against the Indian and for his Thanksgiving turkey. Later pioneers extended civilization westward, pushing the Indians toward the Pacific with the rifle. And only the Indians who were unable to procure the "fire and thunder" of the paleface continued to use the bow-and-arrow. The redman bowed before the superior arms of his enemy. Unable to manufacture such weapons himself, however, he still found it necessary to depend on wood, fibre and sinew for the thousands of weapons he needed both for the warpath and his principal occupation—hunting.

Thus the earliest white inhabitant of the area now comprising the United States knew the bow-and-arrow only as a weapon of the savage. And to him and his descendants, because the North American savage was the only primitive archer they had ever had

intimate acquaintance with, the American Indian was considered the paragon of archers. The paleface and his progeny never associated the bow with the glorious traditions of the European.

THE AMERICAN INDIAN AS AN ARCHER

To the average American of to-day the Indian was and still is the world's greatest archer; whereas, considering the abundance of materials he had at hand and his unrivalled facilities for developing the art, he ought justly to be considered as very poor.

From the modern archer's viewpoint, from the standpoint of accuracy, the American Indian was a very poor shot. With his crude bows and poor arrows nothing much could possibly have been accomplished in the manner of reliable shooting at distant objects. Nor has anything in the nature of an inherited ability of note been observed. If there is any foundation in fact relative to the passing on of inherited tendencies surely Indians of the present generation would not have lost in the course of a very few decades racial characteristics and abilities cultivated and passed on for countless previous generations. Yet, in the instances of record, where the modern Indian has essayed to shoot with the highly developed and efficient bows-and-arrows available to-day, his prowess at hitting marks at the customary target distances have been decidedly disappointing.

Remember, however, that hitherto we have spoken of Indian archery purely from the standpoint of target-shooting—pure accuracy in a definitely measurable degree. In justification of the Indian let us remember that he was a *practical* archer. He lived close to nature and obtained food and clothing largely by hunting. He went into the woods with his simple weapons and either got meat or went hungry. So he took no unnecessary chances of losing his dinner! In a land of dense forest and wilderness he stalked his game with skill and care. Noiselessly he crept to within a few yards of his quarry. He was the world's greatest stalker. He aimed to get so close that he couldn't miss—and in so doing he was a master. On the plains he either disguised himself in the skins of wild animals to get within close range or he rode up alongside the fleeing buffalo on a pony and delivered his shaft from a distance of but several feet.

Being primarily a woodsman, the Indian used a short bow, to avoid unnecessary entanglement with trees and underbrush. He shot from short distances and in various postures—standing, kneeling, crouching. He shot from behind trees and beside bushes. And under such conditions *intuition* rather than real aiming directed his crudely-made shafts toward the mark.

THE ENGLISH YEOMAN

To the English yeoman, however, the bow was a different weapon. Except for occasional poaching, he depended on domestic animals for meat. His food and clothing were largely products of agriculture. With him the bow was essentially an implement of warfare. He fought his battles mainly in the open; and they were essentially duels between organised bodies of men opposing each other in formations. The advantages of superior range, rapidity in shooting and accuracy of shots were paramount. Strong heavy arrows were needed to be effective against the then modern armour. At his ranges, which often exceeded 100 hundred yards, arrows to be effective must be *aimed.* Distances had to be accurately known or estimated and proper elevation allowed. The army with the best trained archers in these respects enjoyed an enormous advantage. Even so, shooting as judged by modern standards was largely by guess work and hits a matter of luck. Nevertheless, the archer was drilled to pull to the ear and draw his arrow to the pile. This excellent practice eliminated many variable factors and elevated archery to the plane of *estimation.* Since bodies of troops in those days were massed in length rather than depth, *elevation* rather than *direction* was the most important aiming factor. An archer might not hit the man he actually aimed at—but so long as he hit another several files to right or left a casualty occurred and his shot could be considered a success.

THE CROSS-BOW

The cross-bow, a more powerful and more accurate weapon, was the chief projectile weapon of the French and Spanish soldier. Shooting a short steel-pointed arrow known as the *bolt* or *quarril,* it was a dangerous contrivance. But the advantage it gave in accuracy and range was more than offset by the rapidity of shooting possible with the simpler bow-and-arrow.

The most powerful form of cross-bow, the arbalest, had to be drawn and set by a windlass.

Old writers estimated that the archer could shoot six times while the cross-bowman discharged one bolt. With the awkward and cumbersome arbalest the disproportion must have been far greater.

The terrible execution done by the English yeomen at the battles of Crécy, Poitiers and Agincourt attested to the superior efficiency of their simple weapons.

EFFECTIVENESS OF THE LONGBOW

The longbow of the English yeoman was undoubtedly the hardest hitting and most effective war bow ever used. It was also the simplest type of weapon and easy to manufacture in large quantities. It obtained its name from the fact that it was decidedly longer than most bows then in general use, being roughly of about the same height as the user. The American Indian seldom made his bow to exceed four and a half or five feet, whereas that of the English archer often exceeded the full six feet.

In the hands of a strong archer the longbow was capable of sending a one and a half-ounce shaft about 200 yards. Although this was less than the extreme effective range of the cross-bow the difficulty in hitting objects shot at from such distances was tremendous, and little serious shooting was attempted at distances in excess of about 100 yards with either type of weapon. At this and at lesser distances the longbow was exceedingly accurate and the vast superiority of its quicker shooting told heavily against an enemy armed with cross-bows and arbalests.

CHAPTER III

THE LONGBOW

It is not our intention herein to trace the authentic history of the longbow, nor to be too meticulous in the matter of historical archery. The present writer instead aims to present the substance of the subject in a sketchy manner, chiefly to provide a suitable background against which the details of modern archery will be more readily perceived and understood.

LONG AND SHORT BOWS

Bows are termed "short" or "long," according to their relative lengths. These are purely comparative terms and the division between short and long as applied to bows is by no means a definite length.

The composite bows of the Turks and Asiatics were distinctly short, as were those of the Assyrians, Egyptians and American Indians. The English yeoman, however, used a bow that was approximately as tall as himself; and it differed so greatly from the generally accepted bow in almost universal use that it was called by a special name. Thus the term "longbow" came to designate this type of weapon.

It is entirely reasonable to suppose that the English archer after all came to develop his lengthy weapon from necessity rather than choice. It is not likely that he had any inherent fondness for encumbering himself unnecessarily with an unduly long bow. The powerful, reflexed composite bows of the Turkish type were wonderfully effective, were much shorter and far more conveniently carried around. But these people were mounted warriors and naturally adopted a compact weapon, just as the cavalryman of to-day prefers a carbine to the longer rifle of the infantry.

The English yeoman was a foot-soldier, however, to whom a comparatively long bow was not so ill adapted.

Furthermore we believe that the longbow was essentially a development of efficiency combined with economy.

The composite bow was a costly weapon and it took many months to combine and work the different materials that went into its fabrication.

BOWS OF YEW

Nature, however, provided an almost ideal material for the bow in the wood of the yew tree, an evergreen similar to our juniper and cedar. And as this wood was comparatively plentiful in western Europe it was used as a matter of economy. One good tree often yielded half a dozen satisfactory staves, and a good bowyer could turn out several serviceable bows a day in an emergency.

Wood of the proper sort has always been the most desirable material for bows, all things considered. It is light, resilient and quick in cast. And of all the woods the yew is by far the best. Wood, however, has its limitations. The horn-and-sinew bows stand bending to an almost unbelievable degree; but wood breaks easily when strained beyond a certain point.

The English yeoman developed the use of a long arrow. It was supposed to be a "clothier's yard" in length. This, authorities contend, was about twenty-seven inches; and as the English archer was taught to draw the arrow to the pile, or head, it was found necessary to make his bow long enough to take this draw without undergoing too much danger of breakage.

A shorter bow of equal poundage casts quicker than a long one; but to make a wooden bow too short is not consistent with safety. Thus an old rule-o'-thumb dictum proclaims that an archer should use a bow of about his own height, for such length of bow is generally needed to take with safety the natural length of arrow that his reach dictates if he shoots in proper form.

After all it is the arrow, not the bow, that is shot; and, for reasons that will be explained more fully in the chapter on *Aiming,* arrows of proper length are necessary for accurate results.

There is a condition of greatest efficiency to every combination of factors. To overdo or overemphasise the importance of any one without giving proper attention to *all* others in correct proportion is to lessen the sum total of result. With the modern archer this everlasting balancing of factors is of the utmost importance, particularly if he desires to attain the best results.

There are so many elusive and apparently insignificant factors involved that the student who desires to apply intelligence of mind as well as trained physical effort will find in scientific archery plenty to engage his most astute faculties.

Until recently progress in archery has been an empirical development. Little has been done to study the various problems related to its *matériel* and ballistic aspects. An interesting field for scientific investigation is here presented. Within the past year, however, Mr. Clarence N. Hickman of Brooklyn, N. Y., has made some interesting studies of a scientific and mathematical nature in regard to bows-and-arrows in the laboratories of the research department of the American Piano Company.

THE LONGBOW IN WARFARE AND SPORT

With the perfection of firearms the bow-and-arrow naturally became obsolete as a weapon of war or as the dependence of a hunter in search of his livelihood or food. Archery as a pastime then came into vogue and as such has continued through various phases to the present day.

Owing to the important part played by the longbow in its national history it is not surprising that the English people entertained an inbred affection for the old weapon; so that when they turned from warfare to recreation it was not unnatural that the same type of weapon should be chosen for their sport. And since archery in the United States has always patterned itself after the English school and traditions we naturally adopted similar ideas and implements in taking up the game.

However, the general adoption of the longbow was no mere accident. The longbow and clothyard shaft have survived to this day as the weapons preferred by the modern archer, not because of any blind adherence to tradition alone, but because, from the standpoint of accuracy, they are efficient weapons.

THE FOUNDATION OF SCIENTIFIC SHOOTING

Modern archery is purely a sport of accuracy and as such may be said to have arrived on the calender of scientific recreations at about the middle of the nineteenth century. Previously the correct principles of accurate shooting were somewhat hazy.

Roger Ascham produced his *Toxophilus* three centuries before and first laid down well-defined principles of handling the tools, but it remained for the late Horace A. Ford to first formulate the correct principles of *aiming*.

Mr. Ford "horrified" the orthodox archers of his country by doing some things in a different way. He was vigorously criticised, as was to be expected. But he made scores that so far outclassed those of contemporaries that he compelled recognition and blind tradition soon melted away before the rays of intelligent application of correct principles.

When Henry VIII was on the throne Roger Ascham enunciated the important objective of archery,—"The purpose of shooting is to hit the mark!"

That is the all-important endeavour! To *hit*—not to aim, or pose, or dress—is still the important consideration!

Results—as *hits* count! All else is secondary!

An arrow aimed at the top of a tree that wabbles and staggers erratically on its course—counts for NINE if it lands in the *Gold*.

A perfect flight that misses the target counts for NOTHING!

Good form and proper technique are necessary for *consistent* hitting; but undue attention to pose, or a stilted style, avails naught if a majority of the arrows land in the "green."

Ford, the greatest shot of all, took up the development where Roger Ascham, a poor archer, left it. Ford first gave us the basic ideas of modern methods.

Ford's work has recently been carried on in the United States, so far as innovations and improvements are concerned. His scores, however, made half a century ago, are still supreme—though several of our best shots are approaching his best records.

The American archer, particularly the novice, though, is apt to disregard sound principles for unsound but plausible theories that are dished up in enormous quantities by enthusiastic but unqualified advisors.

Where tradition and conservatism ruled in former days, at present hasty and often unsound innovation rules the day. Energetic but misguided inventors, who do not understand the basic principles of the art, are flooding the Patent Office with applications. Metal bows, metal arrows, streamline shafts, substitutes for feathers, and various other "improvements" are daily being promoted. A few show merit; but for the most part the much heralded

"new" ideas are simply old notions, many times previously introduced and eventually discarded. The power of advertising is great, and *doodads* and *whatnots* for which remarkable claims will be asserted may be expected in increasing numbers in the near future.

FIG. 5. THE FLODDEN BOW

THE FLODDEN BOW

Curiously, although tens of thousands of bows were made and used in England from the time of William-the-Conqueror until the adoption of firearms, very few old bows have remained. *Figure* 5 shows the Flodden bow, which was obtained from an old house near Flodden Field where the famous battle of 1513 was fought. It was a roughly made self-yew bow that probably drew between 80 and 90 pounds.

Several other bows were recovered from the wreck of the *Mary Rose,* a vessel sunk in the reign of Henry VIII. Two of these are now in the Tower of London. They are unfinished weapons of foreign yew, tapered from the middle to each end, of about 65 pounds' strength.

EFFICIENCY OF THE LONGBOW

The pronounced efficiency of the old English longbow as a weapon in war, we believe, was due to the balancing of many different factors to secure a most efficient or harmonious whole. Almost any bow of moderate strength will cast an arrow about 150 yards. But to attain greater lengths the strength of the bow must be increased in much greater proportion to the additional distance attained. The ultimate range of the old longbow can be put at about 300 yards; but this can only be reached through the employment of very strong and fast bows shooting specially made light flight-arrows. The fast casting Turkish bows reached about 450 yards under similar special conditions. However, at such ranges light arrows are comparatively ineffective as the probability of hitting a given mark is extremely remote.

If we call the maximum *effective* range of the average bow to be in the neighbourhood of 150 yards when used with the usual

arrow, and realise also that the maximum range at which an arrow can be aimed with any reasonable degree of accuracy is about 100 yards, we see that the old English longbow was fully capable of delivering a fairly heavy shaft at any range from which the enemy's "artillery" might prove dangerous. The sharp bodkin-points, backed by the long heavy shaft, carried sufficient momentum to penetrate the best coats-of-mail then in existence.

For accurate target-shooting we continue to use the longbow almost precisely as it was in the days of Robin Hood. All manner of freak contrivances have been periodically introduced; yet the simple longbow is still the standby of the most famous modern archers. They continue to use it in striving for high scores because they still prefer bows of good wood and must make them long enough to resist breaking.

There are, of course, good bows and bad bows. Experienced archers can easily tell them apart. Every bow, like a violin, has a personality of its own. In general, however, the longbow that we use to-day is the same weapon that our ancestors fought with when it was the most effective and deadly weapon of their day.

CHAPTER IV

LEGENDARY FEATS OF ARCHERY

Many legendary feats with the bow-and-arrow have been popularly accepted at face value. What boy has not wondered at the marvellous shooting of Robin Hood, patron saint of archers?

> Locksley returned almost instantly with a willow wand about six feet in length, perfectly straight, and rather thicker than a man's thumb. He began to peel this with great composure, observing at the same time that to ask a good woodsman to shoot at a target so broad as had hitherto been used was to put shame upon his skill . . . walking deliberately to the other end of the lists, and sticking the willow wand upright in the ground (said): "He that hits that rod at five score (100) yards, I call him an archer fit to bear both bow and quiver before a king. . . ."

Since "Locksley" was none other than Robin Hood himself, under an assumed name, in *Ivanhoe,* who can doubt his marvellous skill?

Hansard relates a tale by a poor mariner, Alexander Cockburn, about a century since, who was shipwrecked upon the shores of the Isthmus of Darien:

> He was entertained by some hospitable Indians who exhibited marvelous accuracy with their bows and arrows. They could strike the smallest bird flying. He says he has seen them stand perhaps a hundred yards from the bird feeding upon the ground, and, by shooting directly upwards, cause the arrow to pin it to earth; and mentions, as a further instance of their skill, that they would stick a shaft upright, and, retiring a great way off, shoot perpendicularly as before, when the arrow so shot descended exactly upon the other which was fixed in the ground, and split it in two.

And this from the *Oriental Book of Archery:*

> When Busjady met Cabuscheira on horseback to settle their differences with the bow, instead of shooting to kill his brother, Busjady aimed at Cabuscheira's cheek, and struck from his ear the pendant of pearls, leaving behind the gold ring to which it had been attached.

When we read of such extraordinary shooting with the bow-and-arrow by the ancients, such as the aforementioned and many others in similar vein, it becomes difficult to enthuse over such comparatively "easy" stunts as snuffing a candle or barking a squirrel, as related of Daniel Boone and his contemporaries, with the muzzle-loader!

Nor need we go to ancient archers for a collection of marvellous tales.

SOME MODERN EXAGGERATIONS

Few weeks pass that we do not hear the following tale from some former "great archer" of comparatively recent times:

"When *I* was a boy I was a fine shot with the bow-and-arrow! We made our bows out of umbrella ribs (or hickory), and shot sticks with nails in the end for arrows. I was pretty good—used to shoot rabbits at a hundred yards. Hit 'em nearly every time, too!"

However, we are not without means of checking the probable truth—or more probable *cumulative error in the memory* on the part of these once great archers. We simply invite them to the range, give them a fine bow and some excellent arrows,—and watch the demonstration. It is frequently necessary to tell the victim which end of the arrow he should put on the string. Even the most proficient of these enthusiastic prevaricators find it exceedingly difficult to land arrows within ten feet of a four-foot target from but forty yards—about one-third of the distance they used to "shoot rabbits."

About a year before these lines were written Chief Gray Wolf did a dancing act with his wife at a local theatre. We understood him to say he was of the Choctaw tribe. He honoured us with a visit one afternoon, and, after examining and commenting on several of our best pieces of tackle, recounted his own prowess with the bow.

"I could hit a silver dollar eight times out of ten at fifty yards. I could keep *sixteen* arrows in the air at one time."

Shades of Hiawatha—who, according to Longfellow, could only keep up ten!

Saxton Pope, using special arrows and a peculiar method of holding his shafts for fast nocking *actually* made it *seven*.

Here was a find. We felt that if but a tenth part of his former skill remained we could junk the dancing act and have a real Indian archer to exhibit.

But when we extended the chief the courtesy of our local archery range and offered to provide bows-and-arrows for a trial exhibition, he sadly announced that he was practically blind. So we had to take his word for what he had been able to do—which we have here recorded for the benefit of posterity!

In contrast to these highly imaginative recollections we quote what is undoubtedly more reliable from *My Life With The Eskimo,* by Stefanson.

> Half a dozen of the men at once sent home for their bows, and a block of snow to serve as a target was set up in front of our house. The range at which a target a foot square could be hit with fair regularity turned out to be about thirty or thirty-five yards, and the extreme range of the bow was a bit over one hundred yards, while the range at which caribou are ordinarily shot was shown to be about seventy-five yards.

Such performances are well within reason, in fact are to be regularly expected; but the tales of marvellous shooting by ancient and near ancient archers fail miserably to hold the water of probability when viewed in the light of known facts.

COMPARISON OF MODERN AND ANCIENT ARCHERS

For sheer accuracy, the archers of to-day of expert ability, shooting with the finest weapons ever made, and with an accurate and scientific system of aiming, are making records that would undoubtedly make even Robin Hood—the *actual* Robin Hood—look a mere tyro. Even so, compared to the shooting of a good marksman with an inexpensive .22-calibre rifle, the most expert of modern archers would be hopelessly outpointed.

Some idea of the actual capabilities of the best of modern archers, however, compared to work done with small firearms may be seen from the results of a unique contest held on January 24, 1926, at the armory of the 9th Coast Artillery Regiment in New York City.

General I. Thord-Gray of Greenwich, Conn., who commanded a British division in the World War, shot a challenge match with

the bow against a picked team of twelve pistol shots, they using the standard army .45-calibre automatic pistol.

Shooting at a regulation revolver qualifying-target, 26 inches in diameter, with a 5-inch bull's-eye and outer rings each 1¼ inches wide—counting for 10, 9, 8, 7, 6, 5 and 4 points, respectively, the General scored 508 points with seventy-two arrows,—all but two shots hitting the target. For purposes of comparison this was doubled, giving the General a total of 1016.

The pistol-shooters fired twelve shots each, 144 in all, for the decidedly lesser total of 979.

The General furthermore shot from a distance of *80 yards,* whereas the others fired from *75 yards,* or fifteen feet closer to the target.

This match was no archer's fairy tale, for in describing the event the General wrote: "Conditions were terrible. I had a thousand people in the armory watching, standing in a narrow alleyway on both sides of me, the men calling, talking and pushing me from time to time as I was shooting. I felt so calm that I was surprised and only kept them back far enough so that in case of a broken string a man would not be hit; but after shooting one shot they were all in again, all around me, and I left it at that."

This demonstration was probably the finest shooting ever done with the bow-and-arrow from the distance of eighty yards.

In analysing this performance we must recollect that at distances in excess of ten yards the pistol is notoriously difficult to shoot with accuracy, otherwise the casualty list of pistol victims and successful attempts by police officers to halt fleeing bandits would be much greater. The *expert* archer can group his shots on a target as effectively as the *average* pistol shot, particularly at distances in excess of fifty yards. But the *expert* pistol-shot, using a target-gun, ought easily to beat the best archer, simply because the inherent qualities of the pistol are superior to those of the bow-and-arrow.

The writer would not hesitate to accept a similar challenge to shoot at the standard army target against any ten men *picked by lot* from any regimental unit in the United States—he and they to shoot one hundred times. He will use the bow-and-arrow and each soldier will shoot ten shots, off-hand, with the army rifle.

Such a contest might appear ridiculous to the casual reader. But the *average* soldier is not much of a shot with anything, and

we would be pitting an expert in one line against the average in another.

But let the *expert* rifleman, or even a qualified *marksman* appear singly against the most expert of archers—any attempt at comparison would be laughable! Then, if each man shot with the utmost accuracy, the totals would reflect the proportionate differences in the inherent mechanical capabilities of the respective weapons rather than a comparison of the shooters' personal abilities—and this difference would be preponderatingly in favour of the rifle.

COMPARISON BETWEEN ARROWS AND RIFLE AMMUNITION

If we eliminate the personal equation altogether, we know that arrows cannot be made that will fly better than *approximately* alike. Rifle ammunition, however, can be made to produce innumerable specimens of practically identical similarity. Compared to this remarkable similarity in fixed-ammunition, arrows at best are woefully unalike.

So that when we read of such tales of ancient prowess with the bow-and-arrow as those related at the beginning of this chapter, and compare them with the best shooting of modern sharp-shooters, using the best rifles procurable and the most reliable ammunition, we are prone to believe that reporters sent out by medieval and pre-medieval journals wrote up the ancient sporting events with about the same degree of accuracy that the modern species estimates the "loss of life" in a headlined catastrophe of the present day.

We know that with the best of firearms and ammunition, used with telescopic sights and fixed rests, that it is impossible to expect to make groups as close as those attributed to Robin Hood and other legendary heroes. Those familiar with the *theory of probable error,* on which the science of modern artillery shooting is largely based, will recognise instantly the gross exaggeration in fact of such stories as the nocking of arrows and splitting of willow wands "no thicker than the thumb" at five score yards.

An interesting collection of aboriginal bows-and-arrows can be seen in the National Museum at Washington, D. C. Many life-like groups, depicting savage enterprise and occupations in all quarters of the globe, contain specimens of native bows-and-arrows. Almost without exception they are crude and most unworkmanlike

in construction. With such arrows as the best of those on display, hitting an object the size of a horse with regularity from distances greater than 100 feet would be a miracle! If these can be accepted as fair samples of uncivilized archery we can assay the average stories of savage proficiency as pure figments of an overdeveloped imagination.

NOCKING AN ARROW AT 100 YARDS

An authentic instance of nocking an arrow at 100 yards is told in an anecdote about Horace Ford in the *Archer's Register,* 1881:

> Ford once thought he had met with his match, or rather more than his match, at archery. It was at a meeting on the Royal Ground. He had just shot his end—the distance being 100 yards—and made a central gold. "I'll nock that arrow of yours," remarked a stranger airily, stepping forward to shoot in his turn. He shot and kept his promise, his very first arrow splitting Mr. Ford's last from nock to pile. "Do you often do that sort of thing?" asked Mr. Ford, as soon as he had recovered from his astonishment. "Oh, yes, frequently," was the reply given in a tone of jaunty self-satisfaction indicative of the consciousness of power. "However," said Mr. Ford, in telling the story, "as he never hit the target again all day, I concluded it was an accident, and was relieved accordingly."

GROWTH OF LEGENDS

The innate love of the human being for the bow-and-arrow is probably apparent in direct proportion to the exaggeration of his prowess with it. Peoples exaggerate their abilities in performing acts that stimulate their imagination. Thus an occasional lucky shot as that extremely rare performance related by Mr. Ford, can easily be retold and soon amplified into a common occurrence with continued recounting.

Legends grow in archery as with any other endeavour. The marvellous tales of old archers are plainly myths and must be so considered in the light of reason.

CHAPTER V

A BRIEF SURVEY OF ARCHERY AS A SPORT

The great importance of developing shooting proficiency with the bow-and-arrow when the bow was an important weapon was seen in the encouragement given to archery practice by various English sovereigns. From 1275, through successive reigns, until that of Henry VIII, the practice of archery was not only encouraged, but compelled.

But with the improvement and general adoption of firearms, regulations compelling practice at the butts and laws in regard to the importation of bowstaves were forgotten, and the bow soon fell into disuse.

The general public probably welcomed relief from the necessity of compulsive archery practice—which, no doubt, accounts for the fact that archery in England as a sport has always been peculiar to the upper classes. It is certain that since that time archery has never wanted for aristocratic participation or royal patronage. Henry VIII was a good shot as well as a generous patron of archery; and the unfortunate Anne Boleyn also supported the sport.

THE TOXOPHILUS

In 1545 Roger Ascham, one of the most learned men of his day, presented *Toxophilus* to Henry VIII. The king was so pleased with it that he rewarded Ascham with a pension.

Several years later Ascham was appointed reader to the Princess, afterwards Queen Elizabeth, and her brother; and their skill with the bow was largely due to his instruction.

For the next 200 years various companies and societies of archers flourished in a more or less disorganised state, until 1781, when Sir Ashton Lever formed the Toxophilite Society. This inaugurated the revival of archery at the end of the eighteenth century, and may be regarded as the origin of the sport as we know it to-day.

Within a few years a great number of societies were established

in all parts of England. The Prince of Wales took it up warmly and did much to encourage archery practice by being constantly attendant and shooter at various meetings, also being liberal in donating prizes for competition.

But these early societies were more or less patterned after the modern "athletic club." A bow meeting was an excellent excuse for a dinner. Conviviality was the important feature, and many of the early organisations took more pains to draft dining than shooting regulations. The societies were also very particular in regard to dress—a feature still characteristic of some present-day English archery organisations.

With the increasing number of archery societies their bowmen naturally desired some comparison of one another's prowess. Accordingly, a general meeting was held early in 1789. Customary regulations as to dinner, *costume de rigueur,* etc., were followed.

Similar meetings followed through 1795.

But since more care was taken to chronicle the goodness of the luncheon than the results of the arrows shot, a comparison of their shooting abilities with those of modern archers is impossible.

Archery as a pastime then suffered an eclipse, due, no doubt, to the troubled times brought on by the Napoleonic wars.

When peace was assured, however, the old societies revived and new ones were formed. In 1830 archery again became popular and fashionable.

THE BEGINNING OF MODERN ARCHERY

In 1844 a general meeting of archers was held at York with the idea of taking into consideration a Grand National Meeting of Archers during the ensuing summer. This meeting was held August 1 and 2 at Knavesmire, near York. It was the first of a series of yearly championship meetings which has been continued until the present day.

Since this first Grand National Archery Meeting we notice a different state of affairs. Dining and show took a back seat and competition soon brought about improvement in the scores.

THE ADVENT OF HORACE A. FORD

In 1848 its greatest figure made his initial appearance in the world of archery.

Horace A. Ford, the greatest authentic shooter in history with the bow-and-arrow, attended his first public meeting at the Fifth Grand National Archery Meeting—and stood *fifteenth* in the list.

But the following year he won the champion's medal, which was first awarded on that occasion. He then retained this medal until he had won it for eleven consecutive years. Several years later he won it again for the twelfth and last time.

HIGHEST TOURNAMENT SCORE ON RECORD

At the Fourteenth Grand National Archery Meeting, July 1 and 2, 1857, Mr. Ford made the finest score ever made in public. His 245-1251 points scored for the Double York Round made at that meeting is still the record. For many years it was never even approached. However, in the United States, at the 1910 National Tournament, Dr. Henry B. Richardson turned in a Double York score of 231-1111; and at the 1927 tournament of the Eastern Archery Association Dr. Paul W. Crouch made a 232-1142.

The best tournament score in the Double York Round ever made in this country, and which is second only to the aforementioned record score of Ford's, was the 234-1180 made by Mr. Stanley F. Spencer in November, 1927, at the first annual tournament of the Santa Monica (California) Archers.*

In 1856 a series of articles on the theory and practice of archery, by Ford, first appeared in book form. This was followed by a second edition three years later. Thirty years still later, in 1877,

*After proofs of this volume were made we received notice that, at the Second Annual Tournament of the Santa Monica Archers, November 17 and 18, 1928, Mr. Clinton W. Douglas of Los Angeles, California, succeeded in breaking Mr. Ford's world's record by turning in a score for the Double York Round of 255-1309. Mr. Douglas' astounding scores at this meeting were:

				TOTALS	
DOUBLE YORK ROUND	100 YDS.	80 YDS.	60 YDS.	H. S.	DOUBLE
1st	55-207	47-271	24-148	126-626	
2nd	62-272	43-239	24-172	129-683	255-1309
				TOTALS	
DOUBLE AMERICAN ROUND	60 YDS.	50 YDS.	40 YDS.	H. S.	DOUBLE
1st	30-206	30-216	30-248	90-670	
2nd	30-212	30-184	30-218	90-614	180-1284

This is by far the greatest tournament performance on record, and we regret that we have not time to secure more complete information regarding it before going to press.—A. W. L., JR.

the copyright for this work was purchased from Mr. Ford's family and a new edition, revised and rewritten by Mr. W. Butt, appeared. Mr. Butt was for many years secretary of the Royal Toxophilite Society.

Of Horace Ford, Mr. C. J. Longman, an eminent writer on archery, in the preface to Mr. Butt's edition, said: "He died in the year 1880. His best scores, whether at public matches or private practice, have never been surpassed. But, although no one has risen who can claim that on him has fallen the mantle of Mr. Ford, his work was not in vain. Thanks to the more scientific and rational principles laid down by this great archer, any active lad nowadays can, with a few months' practice, make scores which would have been thought fabulous when George III was king."

We have dealt in this book mainly with archery in England, because it was English archery that formed the basis of the pastime as now organised in this country.

ARCHERY IN CONTINENTAL EUROPE

That the bow-and-arrow is widely used on the continent is ably attested by Dr. R. P. Elmer in *Archery,* his recent book. There, however, archery is the pastime of the common people, rather than a recreation of the leisure classes. In France and Belgium archery is indulged in by far greater numbers even than in Great Britain; however, their games and methods of shooting are so different from those on which our own are patterned that no satisfactory comparison between the respective shooters can be made.

ARCHERY IN THE UNITED STATES

The history of archery as a sport in the United States closely resembles its growth in the British Isles.

The first American archery society was the United Bowmen of Philadelphia, founded in 1828, mainly through the influence of Titian R. Peale, a son of the great artist and an artist himself. This society continued in existence until 1859, when its secretary entered in the minutes the laconic swan-song, "no grounds, no shooting." Its medals and handsome trophies were turned over to the local Historical Society, where they may be seen to-day by any archer who visits Philadelphia. Membership in the United Bowmen was limited to twenty-five. In the thirty-one years of its

existence but fifty-seven members were taken in. One of the latter was Matthias Baldwin, founder of the Locomotive Works. That he was a skilled craftsman, as well as an archer, is evidenced by the beauty of his bows-and-arrows, a number of which are still in existence.

The disbanding of the United Bowmen brought an end to organised archery in the United States for about twenty years. As in England, half a century before, war discouraged many recreational activities.

MAURICE AND WILL THOMPSON

Shortly after the close of the American Civil War, however, two young Georgians, ex-confederate soldiers, went into the Florida wilds in search of game and adventure. Maurice Thompson had been wounded. His doctor prescribed outdoor living as necessary to regaining his health. So Maurice and his brother Will set out to obey the doctor's orders. They were forbidden the use of firearms, on account of their recent belligerency, so adopted the bow-and-arrow as an expedient for providing sustenance. They soon became expert archers, learned to love the bow-and-arrow and practically gave up the use of firearms entirely.

THE WITCHERY OF ARCHERY

> So long as the new moon returns in heaven a bent beautiful bow, so long will the fascination of archery have hold of the hearts of men.

In 1877 and '78 Maurice Thompson published a series of magazine articles which were later collected to form the American archery classic. The *Witchery of Archery,* from which the above excerpt was taken, produced an electrical effect. A new moon of archery came full almost overnight. All over the country people took to shooting with the bow for sport. Archery groups, societies and clubs were organised in every section of the United States.

FOUNDING OF THE NATIONAL ARCHERY ASSN. OF THE U. S.

In January, 1879, representatives from a number of prominent archery clubs met in the mayor's office at Crawfordsville, Indiana.

The National Archery Association of the United States was organised with Maurice Thompson as its president.

The first National Tournament was held in the White Stocking Park at Chicago, in August, 1879. It is related that Will Thompson, who won nearly everything, took his prizes, which were largely in merchandise, away in two big wagon-loads.

But the archery craze of 1878-80 faded out almost as quickly as it had flashed into prominence, like the immense but temporary popularity of Mah Jong in 1925.

Archery in 1878 was a superficial sport. Its devotees, captivated more by the idea of shooting blue herons in the Everglades than by the more substantial aspects of the pastime, were quickly disillusioned by the difficulties incident to the idea. And, like all fancies that take the public by storm, the bow-and-arrow was only taken up to be toyed with a while, then dropped as quickly.

Nevertheless, a few individuals and communities had caught the real spirit of the game. By them the sport was organised, kept alive and developed on a slowly growing but more nearly permanent basis. With the exception of the war years, 1917-18, a National Tournament has been held every year since the first meeting in Chicago.

The National Archery Association of the United States has enjoyed continuous existence since its formation nearly fifty years ago. Few sport controlling bodies in this country can boast of a longer record. Its functioning, however, attracted little publicity; so that to-day, with archery heralded as a "new sport" by multitudes, comparatively few owners of bows-and-arrows are even aware that such a body as the N. A. A. exists.

ARCHERY, AN IDEAL SPORT FOR SMALL CLUBS

Archery is essentially a sport for individuals and small congenial groups. The expense of preparing and equipping a suitable archery range is so small that large clubs are not necessary to carry the financial burden. Consequently publicity and brass-band methods of exploitation are unnecessary. Small groups and societies most intently interested in archery have been more or less self-contained and until recently have not sought due recognition by the daily press.

From 1880 until 1926 organised target-shooting with the bow-

and-arrow was fostered mainly by those who loved the sport itself.

The African adventures of the late Saxton Pope and Arthur Young fired the public imagination again, much as did the tales of the Thompsons fifty years before. A new moon again appeared on the archer's calender. But the conditions lacking in 1878 are largely rectified. Archery to-day is making a bid for popularity on a sounder and more substantial basis.

The almost total eclipse of the archery of 1878 was due to the barren ground on which its seeds fell. There were no traditions to hold the game together. Archery then meant shooting in any manner or fashion, at any target that took the fancy, so long as the arrows lasted, or the bow or bowstring remained unbroken. There was no well-organised game to follow. Furthermore, the great mass of people then were toilers, with little time for recreation.

THE PRESENT REVIVAL OF ARCHERY IN THE UNITED STATES

The ground is better prepared to-day. Tournaments are being held regularly. Records of these meetings, as well as scores made by various individuals in practice, have been carefully preserved in published form; and one interested in the sport to-day can measure his proficiency with respect to that of other archers for the past fifty years. Rules, games and traditions have been worked out and crystallised. The game itself is organised.

Archery itself is in reality making little bid for popularity. Rather, thousands of people who desire an interesting and convenient amusement and recreation realise that shooting with the bow-and-arrow is great fun. Thus, unwittingly taking to the sport of archery as an answer to these needs, they are seeking out old-timers for advice and guidance in the matter.

Archery is again waxing full as a modern sport of the first rank simply because *all* sport is at present popular. Its inherent qualities cannot be hid; so it is due for a prominent place on the general recreational programme.

Fifteen years ago games like golf and tennis were indulged in chiefly by the leisure classes. But during the past few years the public has learned that recreation pays! Wealthy business men formerly had no time for anything but business. They now spend hours at some form of sport—and do more business! For the

less affluent, municipal golf-links, tennis-courts, baseball diamonds, football fields, handball courts, etc., have been provided liberally in every community and in connection with many industrial activities. To-day the *workers* are spending hours untold at play—and do more and better work!

Investment in play has increased health, happiness and efficiency. This idea has been sold to the American public on a great scale during the past decade; so that the main question of importance is—what form of recreation shall the people turn to, to fill the prescription?

If conditions have thus been properly appraised and the present state of affairs continues, the inherent qualities of archery as a means of sport and recreation will compel its widespread recognition. It is a game that is wholesome, healthful, interesting, available, adaptable, and not too costly either in time or money for the man or woman of average means.

ARCHERY AN ADAPTABLE PASTIME

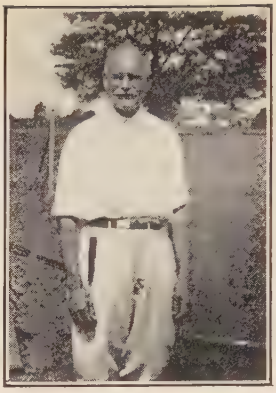
As a sport that is readily adaptable to varying physical conditions of the individual archery has no peer. It is an active pastime, but not violent. As a game for young women it is ideal. Many schools and colleges have discovered in archery a splendid form of exercise for the less robust girls.

Mr. E. D. McLean, whose picture appears on *Plate* I, attended the 1928 National Tournament and shot from a specially-constructed chair. His American Round score of 81-433 made on that occasion would easily win from the great majority of archers.

Excerpts from a letter recently received from McLean attest eloquently to the adaptability of archery as a healthy outdoor sport for many people though hopelessly afflicted:

> "Just supposing you were a fellow who loved outdoor sport, liked to work in wood with tools, loved to shoot and yet lived close enough to a city to make a rifle dangerous. Wouldn't Archery be the solution? And then supposing you were confined to a wheel chair; then Archery would not only be a solution but a Godsend.
>
> "I was severely injured in France in a truck wreck shortly after the Armistice. About three years ago a friend interested me in archery. At first the problem of a proper chair for me to shoot from was difficult to solve. But finally I found a seat discarded from an old coach and

E. D. MC LEAN



LOUIS C. SMITH

A. W. LAMBERT, JR.

GEN. I. THORD-GRAY
A. L. BRUSH

WASHINGTON MONUMENT

DR. R. P. ELMER

J. S. JILES

JAMES DUFF

WM. H. PALMER, JR.

PLATE I

Some Archers of Note

mounted it on legs and the problem was solved. I found others to shoot with and we started practicing. Our club has shot for three years now, four or more of us shooting Saturday and Sunday afternoons. For two years I showed no improvement, shooting around 200 at the American, then I jumped almost suddenly to an average over four hundred with a high of 511.

"To get the sensation of the way in which I shoot, seat yourself in a chair and put your feet on another chair or a stool. It is not at all easy. I have no muscles below the chest to help me shoot and that is why you would have to elevate your feet to make all your muscles below the waist useless. I would be much interested to have some one try this and let me know the results as compared to their regular score. The boys here have tried it and cut their score in half. . . .

"My High American:

30-146 29-163 30-202 89-511

"My High York:

15- 83 24-110 20- 72 59-265

"My High Metropolitan:

7- 23 11- 47 24-138 27-143 30-182 99-533"

These are scores that many an able-bodied archer might be proud of.

But do not think for the moment that archery is a sport for weaklings. A strong man has an enormous advantage over his weaker brother. He can use much stronger bows, which gives him a decided advantage, particularly at the longer ranges of that real test of the archer—the York Round.

At the 1927 National Tournament, at Soldiers' Field, Cambridge, Mass., to make up lost time due to rain, in one day the men shot through the eighty and sixty yards of an interrupted first York Round, then shot the second complete, and finished the day by completing the first American. The shooting began shortly after nine o'clock in the morning and continued without interruption, save for half an hour for lunch, until after seven o'clock that night. Should any skeptic desire to learn wherein lies the exercise in archery, let him take up a bow that draws about fifty pounds and go through such an endurance test himself.

SCIENTIFIC ARCHERY

Scientific archery is a most fascinating study. Any one can learn to shoot well enough in half an hour to begin to enjoy the

game; but high scores are only made through painstaking adherence to proper technique and equipment. The many and interesting problems sustain interest. Like astronomers, students of archery soon learn that added knowledge only serves to uncover still wider fields for investigation. For this reason archery has ever been conspicuous for the class of people it has attracted. Authors, artists, sculptors, teachers, doctors, students, engineers, lawyers—such is the class of people for whom archery holds a peculiar fascination.

Archery clubs, too, are almost as easy to form as bridge clubs. The expense of targets and ground upkeep is practically nothing when borne by half a dozen members. Archery is a great social pastime too, since two or more persons of different abilities can shoot together, each enjoying the game without in the least spoiling that of the other.

A great advance in archery has been made by American Archers during the past five years. The records of modern meetings show that the American man on the average exceeds the best now produced by Great Britain. With the women, however, the reverse is true.

With the single exception of Horace Ford, there are half a dozen archers in this country to-day who habitually exceed the best scores of England's best archers of record.

Ford was a genius, such as is produced in any field of endeavour but once in an age. He was a superman with the bow-and-arrow. However, we now have several archers here, for the first time in history, who are steadily climbing into Ford's hitherto uncontested sphere.* Our Dr. Paul W. Crouch, now recognised as the best archer this country has produced, could easily have beaten any recorded contestant in the Grand National Archery Meetings with the single exception of Ford; and it is entirely probable that had Ford and Crouch competed against one another during the eleven years of Mr. Ford's supremacy the champion's medal would have alternated between the two.

*Mr. Ford's best score for the York Round is reported in Badminton:

100 yds.	80 yds.	60 yds.	H. S.
66-344	47-301	24-164	137-809

This score, made with a yew-backed-yew bow and 5s arrows, is little less than miraculous.

CHAPTER VI

GENERAL CHARACTERISTICS OF THE TARGET-BOW

The target-bow of to-day is essentially the long bow of the English yeoman. However, it differs from its prototype as a draft animal differs from a racehorse.

Quickness of cast, perfect balance and smoothness of draw are essential to the desirable target-weapon.

Target-arrows are lighter than war or hunting-arrows, consequently heavy bows are not necessary to give equal flights.

For scientific target-shooting—where consistent high scoring is the sole object—the arrow, not the bow, is really the important item of the archer. As we shall explain more fully later, an arrow must be long enough to reach from the anchor-point of draw, usually under the chin, to the resting place on the bow hand when the left, or bow-arm is extended to its proper position.

This distance differs from about twenty-four to twenty-eight inches with individuals. But as standardisation is desired we have but two general lengths of arrows: (1) persons of tall stature habitually use *twenty-eight*-inch arrows, (2) those of short stature use the *twenty-five*-inch size. Men are usually classed under the first category, women under the second; but it should be borne in mind that stature and reach rather than sex should dictate the size of tackle used.

Experience has shown that for safety it is advisable to make a wooden bow six feet long if it is to take a twenty-eight-inch arrow, five and a half to take the twenty-five-inch shaft.

A shorter bow of the same weight gives a correspondingly faster cast, but is more apt to break. Many archers liven up a sluggish bow by taking off an inch or so if they think the bow will stand it.

In spite of their greater length, men's bows are usually stronger in proportion to length than those used by women and are subjected to far greater strains in drawing; thus bowyers always reserve better staves for the longer bows, and the very best staves for the strong ones.

It is an old saying amongst archers that "a bow fully drawn is seven-eighths broken!" This maxim should be taken to heart by beginners,—older archers have usually learned its truth through sad experience.

Bows are made to take certain maximum lengths of arrows, and a good bow will nearly always break if this point is exceeded!

The following constitutes the nomenclature of the principal parts of the bow:

Back: The outer or convex surface of the bow when drawn. The side held away from the archer. The back is usually flat or nearly so.

Body: The concave or inner portion. Also known as the **belly**. The body of the bow is nearly always rounded.

Limbs: The upper and lower halves of the bow.

Handle: The mid portion. The grip.

Nocks: Notches at the extremities of each limb to hold the bowstring in place. Usually employed to designate notches filed in the ends of the limb itself.

Horns: End extremities furnished on the better grades of bows. Usually made of cow-horn. The upper horn is often made to some fancy shape. Notches for the bowstring are filed in the horn.

Arrow-Plate: A bit of leather glued on or a small piece of horn, fibre, mother-of-pearl or other hard substance inlaid in the side of the bow just above the handle. It is supposed to prevent friction of the arrow from wearing into the bow. In reality it is a decoration that is often omitted. Its most useful purpose is to aid in distinguishing the upper from the lower limb.

True-Centre: The exact mid-point between the two nocks. The handle or grip usually extends one inch above and three inches below the true-centre, thus making the upper limb of the bow slightly longer than the lower.

Weight: The tensile effort necessary to draw the string back to the point of full-draw, expressed in *pounds*. Not the actual weight of the bow itself.

Bows are differentiated according to their shapes, proportions, construction, action, and other individual characteristics. The predominance of any one quality is largely a matter of taste.

Bows of different characteristics are used for different purposes just as different musical instruments play different rôles in orchestration.

No two archers agree thoroughly on archery matters, particularly as to details of material and technique. Some swear by one feature, others rely on another. There is no accounting for ideas in archery!

The present writer is but one of many enthusiastic devotees of the sport, and, although he has acquired a fair degree of proficiency—sufficient, perhaps, to entitle him to the right to be considered above the average novice—he knows better than to presume to lay down rules and regulations as fast and rigid principles—and expect all archers to agree thoroughly with what he has to say! Nevertheless he has heard so many ill-qualified opinions and such patently unsound advice to the beginner, that it may not be out of order to herein venture some rather positive opinions of his own.

TRADITION VS. MODERN INNOVATION

As mentioned before, *tradition* has played a very important rôle in the development of modern archery—particularly abroad. In the United States tradition was closely adhered to to get a start. But the experienced archers in this country are not averse to breaking away from traditional practices if these traditions are not based on sound mechanical principles or good sense.

We do not wish to encourage the novice to be too ready to break away from established practices, however,—before he is competent to judge of the evidence. Tradition is the crystallised experience of many predecessors, and in general is good rather than bad.

There is practically nothing new in archery. It is one of the oldest subjects under the sun, and practically everything that the enthusiastic newcomer of inventive proclivities can think of has probably been "invented" many times before—and discarded.

The bow-and-arrow is so simple that it is safe to say no major improvement or magical producers of high scores is imminent. New materials for bow-and-arrow making are constantly being sought, particularly in the realm of metals. But, so long as archers continue to use age-old and time-tested materials, the principal

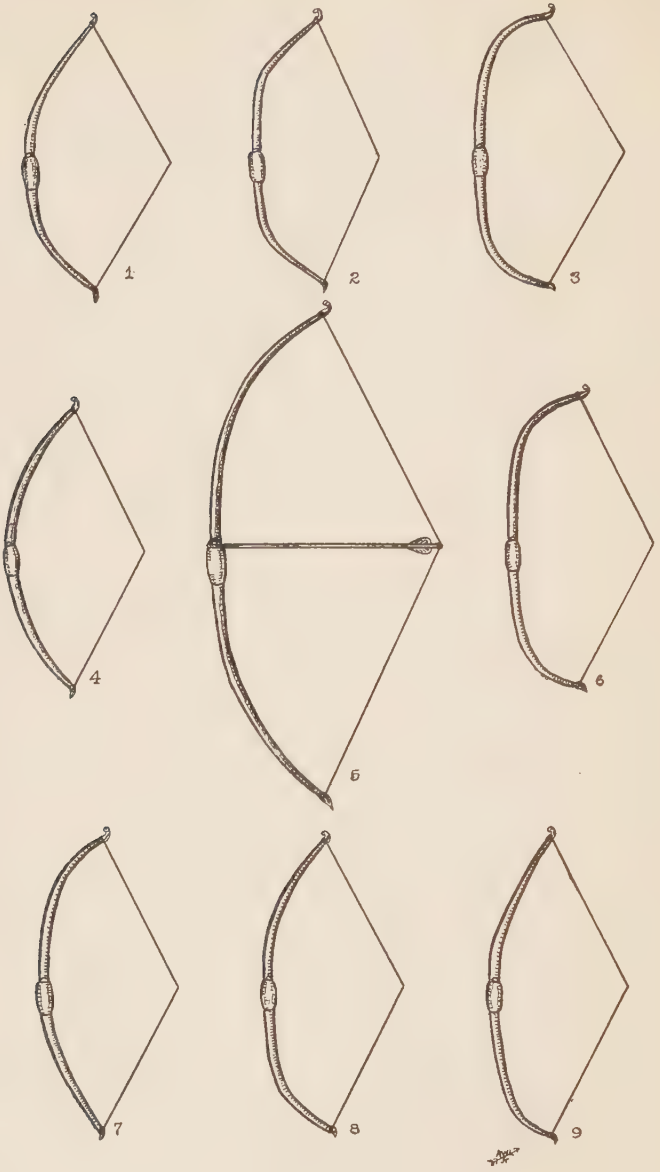


FIG. 6. CHARACTERISTIC BOWS

1. Close-Hinged Bow. 2. Mid-Hinged Bow. 3. Whip-Ended Bow. 4. Bends in Handle. 5. A Good Bow. 6. Extreme Whip-Ended. 7. Stiff Lower Limb. 8. Hinged Lower Limb. 9. Close-Hinged Upper Limb, Whip-Ended Lower.

field for improvement lies in understanding the character of these to the fullest extent and learning to become most proficient in their use.

JUDGING GOOD AND BAD BOWS BY THEIR SHAPES

A fully-drawn bow may be classified according to the curvature of its limbs. The usual outlines—good and bad—taken by target-bows are shown in *Figure 6*.

A **hinged bow** is one that has a decidedly sharp bend or "hinge" in one or both limbs. In the **close-hinged bow** (1), this bend is close in to the handle, leaving the extremities of each limb practically straight.

In the **mid-hinged bow** (2), the handle-section is made stiff enough to resist bending, the mid-section of each limb is "worked," and the six or eight inches nearest the nocks are left stiff.

The **whip-ended bow** (3), is decidedly stiff in the middle and for several inches above and below the handle. The limbs are "worked" evenly from beyond this section to the nocks.

So long as the two limbs work evenly, a bow may be decidedly **hinged** or **whipped** and still be a fair bow. But if the bow be a dissymmetrical or "mongrel" weapon, or if its two limbs be of unequal strength, it is an inferior bow and ought to be corrected by reducing the strong portions, to bring about the desired balance and equality of action. This equalization will, of course, reduce the **weight** of the bow.

No matter what fault a bow might have, it will shoot so long as it remains a bow. But a bow that is well balanced and free from jarring and kicking is far more pleasant to shoot and should enable the user to make higher scores than a poor specimen.

A bow that bends in the handle when drawn (4), *Figure 6*, may describe the "perfect arc" of the poets, but it will kick unmercifully and be altogether disagreeable in use.

An extremely **whip-ended bow** is depicted in (6), *Figure 6*. This is in effect a short bow that has been cut in two and the parts separated by a stiff middle-section.

At (7) we have a bow that is too stiff in the lower limb. Sketch (8) shows a bow that is too stiff in the upper limb with an accentuated hinge in the lower. Sketch (9) shows one that is **close-hinged** in the upper limb and **whip-ended** in the lower.

The central figure, (5), shows our conception of a good bow—in so far as a sketch can depict it. It is a tracing from a photograph of the bow shown in the writer's hands in the Washington Monument picture and in the snapshot of him in aiming-position shown on *Plate* 1,—a most remarkable self-yew bow of about forty-eight pounds that could send a five-shilling arrow to the target at 100 yards with the point-of-aim practically on the target.

Whip-ended bows are pleasant to use and good in cast. Dense, hard-drawing woods are often made into **whip-ended bows** to

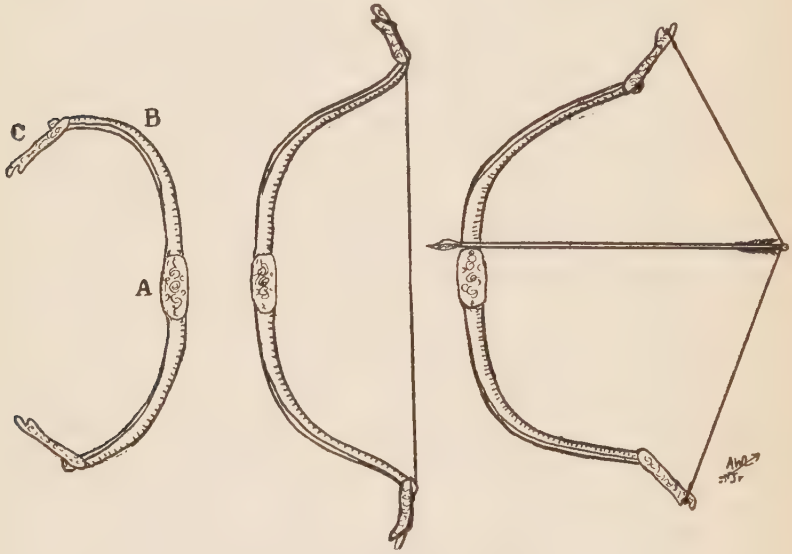


FIG. 7. THE ORIENTAL BOW
Unstrung, Strung and Fully Drawn.

sweeten their draw and nullify the tendency to jar. But this effect is obtained at the expense of safety, since the sharp bend in the limbs at the narrow extremities confine the bending strains within an unduly restricted area. **Whip-ended bows** are prone to easy splintering in the back and have an accentuated tendency to follow the string.

The **mid-hinged bow** is closely related to the **whip-ended** type.

The **close-hinged bow** is in reality a short bow—with eight or ten inches of stiff wood projecting beyond the natural place for the nocks. The added length to the limbs makes it possible to use a longer arrow without unduly straining the bow at full-draw.

It also gives the limbs an additional leverage, after the manner of the long switch used by a small boy to increase his effective range with mud-balls. The comparatively short bend, being close to the handle where the back is widest, is not so apt to be dangerous, as is a similar sharpness of bend at the other extremity.

A **close-hinged** bow must be carefully balanced to eliminate jar. If well made, however, it gives one the advantage of the shorter bow used with the longer arrow.

The short Oriental bows seem to have been of a decidedly close-hinged type. *Figure* 7 shows a typical specimen in unstrung, strung and fully drawn positions. When the string is removed these bows reverse themselves in shape. Such bows are termed **reflexed,** since considerable tension is necessary to bring and hold them in the strung but undrawn condition.

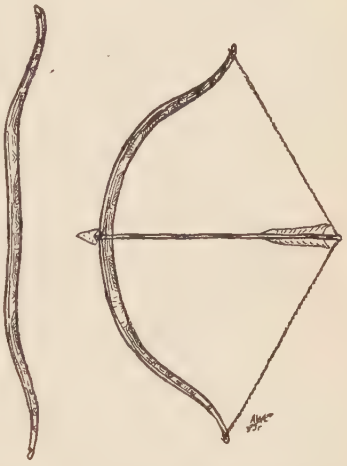


FIG. 8. INDIAN BOW WITH RECURVED LIMBS

In these bows the handle section (**A**) is stiff and unyielding. The mid-section (**B**) of the limbs, adjacent to the handle, are flexible and furnish the action. The **ears** (**C**) are stiff and act mainly as extensions to the limbs to give a lever-like action. To insure stiffness these ear-portions are made recurved, or bent, in an opposite direction to the curve of the drawn bow itself.

The American Indian often made wooden bows with recurved ears, as shown in *Figure* 8. But other Indian bows have the extremities curved the other way, *Figure* 9. The latter were usually very short and exceedingly stiff. The same was true of a short Egyptian bow we once saw that was thought to be many centuries old.

Why the Indian recurved his bows according to the classic outline we are not prepared to say; but we believe he was influenced more by attempt to gain artistic effect than for any mechanical advantage. In the second type the whip-ended-like bend was undoubtedly given to make it possible to string a very short and stiff bow without putting it under too much initial strain.

Due to their artistic appearance and inherent beauty of outline the influence of these recurved weapons is hard to resist and examples of bows with the pretty "double curve" can be seen at almost any gathering of archers.

The most desirable bow, all things considered, is stiff and bulky in the handle, but bends in an otherwise even, graceful arc from handle section to each end. The working strains are then distributed throughout the entire limb so that no comparatively small portion is apt to be unduly strained. We prefer a bow that bends from handle to horn, except that in the upper limb, to compensate for its extra length, no bending should occur within two inches of the top of the grip.

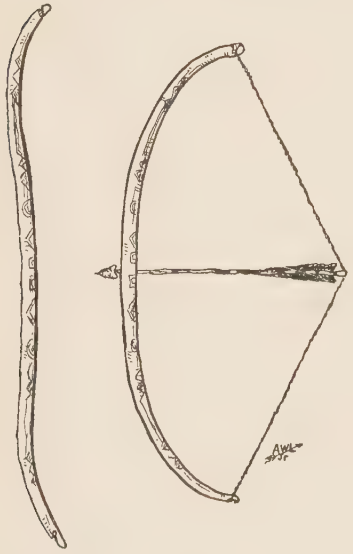


FIG. 9. SHORT INDIAN BOW WITH ENDS BENT TO FACILITATE STRINGING

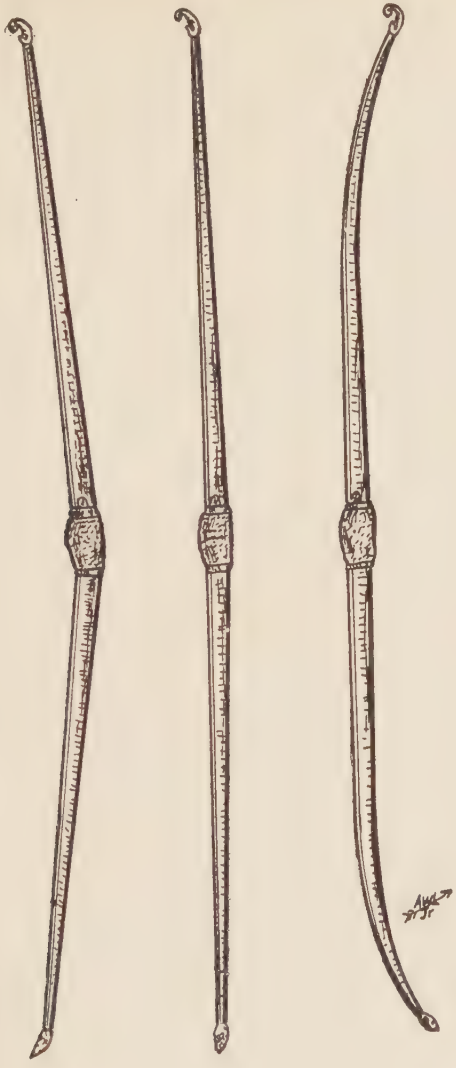
It is also proper for the upper limb to appear slightly weaker than the lower, particularly in a new bow.

The bow is usually made from a perfectly straight stave. Curvature seen in the limbs of an unstrung bow is due to a later permanent-set of the wood. The taking of this permanent-set is termed **following the string,** and all bows take it to a greater or less degree. But in well seasoned lancewood, osage-orange, washaba, etc., the set is hardly noticeable, and the unstrung bow returns very nearly to its original straightness.

American yew takes a slight set. Lemonwood takes a decided set, particularly if there is a hinge or weak spot. However, in these two great bow-woods, once the set has been assumed it goes no farther. Woods like hickory take a set that grows continually deeper with use.

A moderate set in a bow is advantageous. It makes the bow easy and pleasant to shoot, is not so apt to have an unpleasant recoil, and is easy on bowstrings.

To compensate for permanent-set **reflexed bows** are made. Sometimes full-length staves are naturally reflexed. **Grafted bows,**



(1) (2) (3)

FIG. 10. TARGET BOWS UNSTRUNG

(1) A Badly Reflexed Bow.
(2) A Bow that Comes Straight.
(3) A Bow that has Followed the String.

however, are nearly always made so by joining the two half-staves together at a slight angle.

A **reflexed bow** has a faster cast than an ordinary bow; but this advantage is gained at the expense of safety, steadiness in hand and bowstring economy. The apparent added strength is only the effect of what amounts to an overdraw.

Any undue setting back in the handle of a grafted stave to bring about a reflexed condition in the finished bow is better avoided. A slight angle of set-back, merely to compensate for the permanent set expected, is permissible. But in the finished weapon the nocks should not return beyond the straight line position, as shown in (2) of *Figure* 10.

The two limbs of a bow should bend evenly and act precisely together. The careful balancing of its limbs to assure this is the work of an expert, often takes a great deal of time, and must be done by hand. A bow that bends too much in one limb, particularly the lower, is on the road to being broken.

When a good bow is strung the string ought to divide the bow in half down its entire length. If one side is weaker than the other the bow will string up awry or lopsided. Sometimes this defect will disappear in a newly made bow if it be carefully exercised by drawing it up and back several times. A **wry** bow will shoot, but has a tendency to twist in the hand and shoot off more or less to one side. If the bow is lopsided it is better to have it incline to the side against which the arrow is held, since this tends to neutralise the necessity for shooting "around the bow," an effect we will discuss more fully later in connection with the **Archer's Paradox.**

METAL BOWS

A successful metal bow has been the dream of many inventors. Steel has been the most common material proposed. Steel bows have been made in a multitude of shapes and cross-sections, and of innumerable alloys. Until quite recently steel bows have been very poor in cast. Tubular bows and bows of T-shaped cross-section have been tried. The former broke quite easily whereas the latter were exceedingly sluggish.

The American Fork and Hoe Company has recently developed a surprisingly good steel bow having a U-shaped cross-section.

Dr. R. P. Elmer is shown with one of these bows in the *frontispiece*. They are shorter than the usual target-bow and come apart in the handle, making them convenient bows for travelling.

The steel bow can be placed in the same category as steel casting-rods. Though not so pleasant to shoot and heavier in hand than good wood, the latest developed steel bows have excellent shooting qualities, which will undoubtedly be improved in the near future.

Two advantages of importance with steel bows are: they do not vary in weight, or cast, with changes in temperature, and they are not so apt to break in cold weather. The latter feature should make them popular for hunting.

Personal tastes, as we have said before, differ. Many archers will undoubtedly take to metal. But for smoothness of draw, light weight in hand, resiliency and character we do not think metal will soon replace wood.

A decided advantage resulting from a satisfactory metal bow would be in the line of good bows at low cost. Good wood bows must be made by hand, and each stave is different and must be worked differently from the rest. But, once developed, hundreds of duplicates could be fabricated in metal. Then, for the average archer, certain desirable but subtle qualities could be sacrificed in behalf of economy.

MODERN COMPOSITE BOWS

Several Oriental or Composite bows have been made in recent times. Saxton Pope made a bow of this type, as described in his book *Hunting With the Bow and Arrow.*

An imitation Oriental bow can be made by affixing a celluloid body to a thin foundation of hickory and making the tensile member, or back, of tennis-racquet strings.

But, in spite of our native ingenuity, it is probable that the great majority of leading archers will continue to favour the wooden weapon, particularly a well-made bow of yew.

CHAPTER VII

THE MANUFACTURE AND MATERIAL OF BOWS

Bow-making is a trade, and we can not deal too specifically on the subject in this book. We aim, rather, to explain in a general way just what happens when the archer uses his equipment, so his use of archery tackle is not altogether a mere mechanical or physical function.

The ambitious archer is urged to make bows-and-arrows. In general, homemade equipment is inferior to professionally-made tackle; but by attempting to make serviceable tackle, whether for personal use or not, an archer adds directly to his general knowledge of archery, learns the difference between good and bad in the best possible manner, and indirectly adds to his scoring ability.

The amateur bowyer and fletcher is urged to read all books he can obtain on the subject, particularly Mr. Duff's recent work. Experimentation with different materials and the fabrication of different types of tackle are most interesting endeavours.

Bow making is akin to violin making; and the cheap, standardised, commercial instrument bears about the same relative comparison to a choice specimen in the one field as in the other.

LOG AND LUMBER BOWS

There are two great classifications to bows: (1) **log-bows**, and (2) **lumber-bows.**

We refer to **log-bows** as those made from staves split from the log itself, in which the bow is made so that its **profile** follows the natural flow of the grain. **Lumber-bows** are made from boards or staves sawed out of the original timber without particular regard to the irregularities of grain. Such bows are usually made from square staves having planed surfaces, and are perfectly symmetrical and pleasing to the uninitiated eye when well finished.

Log-bows are apt to be ugly and irregular in form.

A second general classification of bows divides them into: (1) **self-bows,** and (2) **backed-bows.**

The **self-bow** is made from a single stave.

Backed-bows are made from two or more strips of wood, glued together.

Either **self-** or **backed-bows** may be protected against splintering by an additional "backing" of some tough material, as **raw-hide** or thin **fibre.**

Bows of either type may be still further classed as: (1) bows made from single **full-length** staves, (2) bows made from two **half-length** staves, and (3) **jointed-bows,** or bows that come apart in the middle.

Bows that are made from **half-staves** permanently joined together in the middle are termed **grafted-bows.**

The reader will absorb a clear understanding of these different types and classifications as we go on.

Any stick that can be bent without breaking will serve for a bow. But some varieties of wood have qualities that make for better bows than others; and one of the fascinating phases of archery lies in the testing out for comparison of the different woods available. No matter what the opinion of others may be, the true enthusiast will seldom rest until he has worked with and tried out every available variety of materials, to learn their relative values from personal experience.

Bows are made of wood and no two sticks are alike. If bows, like table-legs or bannisters, served a static purpose, they could be turned out by automatic machinery, to pattern, at ridiculously low cost. However, a bow is a dynamic implement, and in the performance of its work severe bending is experienced. Tensile and compression strains of almost ultimate limit are put on the fibres of the material, yet the bow must hold. Furthermore, its two limbs must be balanced so each does exactly its share of the work with respect to the other, and in unison.

In a full six-foot stave the grain at one end is usually coarser than at the other. Knots, pins, cross-grains, checks, scratches and other blemishes appear in most embarrassing places. So each piece must be treated separately. Every defect must be considered. Every bowstave is a law unto itself! It is the special hand treatment and individual painstaking consideration necessary with each stave that makes mass production of first-class bows almost impossible.

THE LOG-BOW

The most efficient as well as most expensive type of bow is the **log-bow.** It comes from the tree direct. A stave, long enough for the bow and about three inches square is first split out of the butt of the parent tree, and after proper seasoning and aging the bow is carefully fashioned along the natural lines of growth. In the best grades of bow-wood six-foot staves are a rarity, owing to the prevalence of knots and pins, which seem characteristic of woods of the proper elastic texture. Therefore, half-length staves are usually used—to make either a **grafted-** or a **jointed-bow.** And these are usually the best bows, since half staves are usually freer from blemishes and can be matched, so both limbs are alike in relative texture from handle to horn.

The making of weak bows—those drawing less than thirty pounds—presents little serious difficulty, no matter what wood is used. Bows drawing between thirty and forty pounds must be made with care. But for strong bows only the best of material and workmanship will suffice. Bows stronger than fifty pounds, in our opinion, are utterly foolish for target-work and need not be considered here.

The most important consideration in choosing a bow is to assure one's self that the finished bow will stand the bending necessary without breaking. From this viewpoint a green sapling is excellent. Almost any green tree will yield a satisfactory bow from this standpoint alone. Willow, rattan or bamboo can be tied into knots without breaking. However, such woods have no spring. They lack elasticity and are therefore useless. We must use a wood that will both stand bending strains to the necessary degree without fracture,—and which will *quickly resume its original shape* when the strain is released. This eliminates the great majority of woods from any consideration.

HICKORY BOWS

The most common wood in this country that is at all suitable for bows is hickory. A fairly straight stave can be procured on short notice in almost any locality. Though hickory is not a first-class bow-wood,—if nothing else is available by all means use it.

Hickory can stand tremendous tensile strains without splintering, but it does not withstand the crushing stresses set up in the body

of a bow. It soon follows the string badly and gets decidedly sluggish and lazy. The white second-growth hickory makes a better looking bow; but for shooting-qualities, if hickory must be used, we prefer the black forest-grade. This is more liable to splinter than the white and is more difficult to make into a bow that does not break at full-draw; but, being tougher and denser, it is less apt to follow the string.

Almost any dense hardwood is free from this chief defect of hickory. However, the usual hardwoods are brittle and will not stand the bending without splintering. Alone they are useless, since not even a poor bow can be made from them.

BACKED-BOWS

But if we combine two different woods by gluing a layer of hickory onto the face of a piece of satisfactory hardwood, we obtain a double-wood stave that sufficiently resists splintering in the back and withstands the crushing force in the compressed body. Bows are frequently made of such combinations and are known as backed-bows. For the backs we naturally seek the toughest tensile wood that can be procured. It is here that the extremely strong second-growth white hickory is almost supreme.

To minimise the danger of breaking many savages fastened a layer of rawhide or sinew to the backs of their weapons. This idea is still used, particularly to protect strong hunting bows. Thin layers of clarified calf-skin is a common backing; and lately thin strips of sheet fibre, such as is used in the electrical industry, is coming into prominence.

In bow-making the back is the most important member. We care little about minor defects in the body; but the ideal back should have the grain running in practically unbroken lines from one nock to the other.

Breaking down in the back, while the main consideration, is by no means the only danger. If the bow is a strong one a terrific strain is put on the outermost layers of the back—which must be held. At the same time the inmost portion of the body is subjected to excessive compression; and, unless the material there can withstand this, another fault known as chrysaling or pinching develops and the bow breaks just the same.

Many dense woods can be used in the bodies of bows for a

while; but in the great majority, sooner or later, **chrysaling** begins. The disease first exhibits itself as a multitude of little transverse cracks that appear to be checks in the varnish. The appearance of these is shown in *Figure* 11.

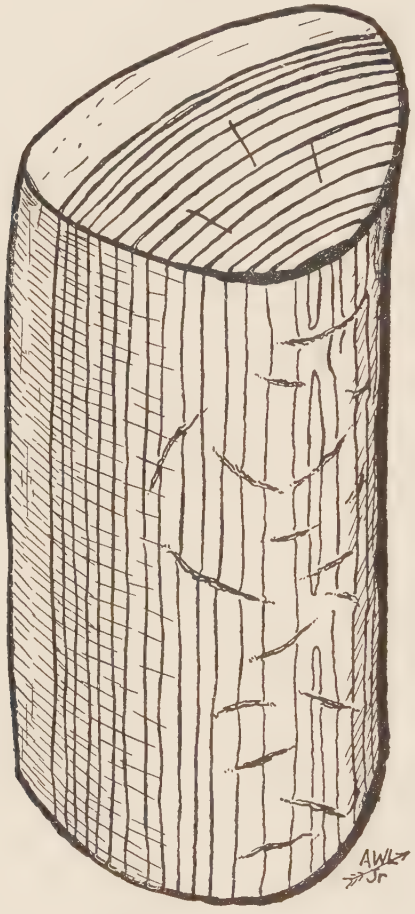


FIG. 11. CHRYSALING

Many fancy woods are periodically "discovered" as superior bow-woods, particularly when backed with hickory. Usually they prove old discarded materials popping up again for enthusiastic amateurs to experiment with.

The term bow-wood as used by the old bowyer, however, is

limited to woods that have proved durable in the test of time. A bow-wood must stand against chrysaling as well as resist splintering. And in the softer woods such as the yew it is by no means entirely absent. However, in bows of moderate weight the appearance of a multitude of small chrysals need not cause undue alarm—unless the disease gains headway. If the small cracks deepen and widen, particularly if they tend to open when the bow is unstrung, —there is nothing to remedy the condition and the bow will soon give way.

MECHANICAL ACTION OF BOWS

Let us now consider what happens when a bow is bent. It is obvious that the inside, or body, is compressed as the string is drawn back. The back, on the other hand, is stretched and tends to become slightly longer. Somewhere in between the outer and inner surfaces is a thin layer that simply bends without being either stretched or compressed. This is the neutral-layer.

This neutral-layer is largely a theoretical conception, yet in effect it is present in every bow. In the composite bows the very thin wooden foundation could be considered precisely in this light. Being very thin, it mainly bent without contributing any appreciable dynamic action in itself. The horn material, which composed the body of the bow, was compressed as the string was drawn; whereas that portion of the bow that lay in front of the thin wooden foundation was stretched and was accordingly made from strands of sinew that ran in unbroken lengths from one end to the other.

In the ordinary wooden bow the neutral-layer can be said to be located about one-third of the way from back to inner surface. This, however, is merely an approximation.

Bowyers in the past followed the custom of providing backed-bows with a very thin veneer of backing. Such a backing therefore tended to act mainly as a constraining band—to prevent the bow from splintering. It played practically no part in the cast. Former archers seemed to think that the power of the bow came almost wholly from the inner wood. The Thompsons held to this idea and in support of their view Saxton Pope a few years ago constructed two miniature bows—one of sap-wood and the other of heart-wood of yew. Because the little heart-wood bow outshot the other, he concluded that the sap-wood merely performed a pro-

tective function and that it could be dispensed with if rawhide were substituted.

The writer believes this theory, applied to full-size bows, is wrong!

Unquestionably a small bow made entirely of a dense, elastic material would outshoot a similar bow made from a tough, stringy material; and in a miniature bow the weapon would withstand a fair amount of bending without breaking, even though made entirely of a brittle wood. But in a man's-size bow of comparatively bulky cross-section the elastic action is a different matter.

We have long insisted on a thick back and have followed the practice in making backed-bows—also in making yew bows—of keeping the depth of the backing material approximately one-third of the depth of the limb itself. Although this is as yet a more or less unconfirmed opinion—it has been apparently justified in results.

The writer's favourite yew bow referred to on *Page* 40 was used at the 1926 and 1927 National Tournaments, at several minor tournaments and on numerous practice occasions. Its depth of sapwood seldom failed to draw adverse comment from the older archers. Yet the same persons marvelled at the low trajectory of its arrows.

At the 1928 National Tournament, at the Westchester-Biltmore Country Club, Rye, N. Y., we used another yew bow of similar character, which bow is pictured in the series of position-pictures on *Plate* V. The arrows used weighed about 390 grains, and our point-of-aim was but one target above the target at 100 yards. The remarkable speed of the arrows and their flat trajectories was frequently commented on, yet the bow drew only about forty-two pounds. On this occasion many other archers who were using much heavier bows had to aim at the distant tree-tops to get their arrows to the target.

We attributed this efficiency, not to any particular excellence inherent in the stave, but to the fact that the bow was designed properly and made right.

Further experience with both yew and hickory-backed bows of various combinations also add weight to the soundness of the deep-back contention.

Our reason for this apparent soundness in deep-backing lies in what we believe to be sound engineering.

THE NEUTRAL-LAYER

A bow is essentially a beam; and a beam under a bending-load is subjected to two kinds of strain. The convex portion, which corresponds to the backing of a bow, is under tensile strain; whereas the concave, or inner part, is compressed, as in the body of the bow. Somewhere, however, there is a fairly well-defined zone that is simply flexed. This is termed the **neutral-layer**; and in a beam of homogeneous material this **neutral-layer** passes through the centre-of-gravity of the cross-section.

In the average bow, with flat back and rounded body, the **neutral-layer** may be assumed to be approximately one-third of the way from back to inner surface.

Keeping this assumption, as to the fact and location of the **neutral-layer**, in mind we deduce that the outer third of the bow is under tension—from the **neutral-layer** to the outside, with the degree of tension increasing from zero at the **neutral-layer** to a maximum on the outside. This being so, it is proper to make this portion of the bow of a substance that—like a rubber band—bears stretching. And for this portion of the bow we should use a wood of long-fibred, extremely tough material. But for the inside or body portion, where there is no pulling apart, we can use a brittle, dense or even crystalline material.

We believe that we have obtained better casting bows per pound of draw by basing our construction along such principles, so we emphatically advocate a thick back of proper material for bows of this class.

Bow-woods, however, at best are none too good, and are by no means homogeneous in cross-section. We cannot stick to theoretical conceptions too closely. But if we keep the proper engineering principles in mind and follow them as closely as we can we shall be assured of better results.

For practical purposes a strip of white hickory about 5/16 inch thick, glued securely to the main portion of the stave serves very well. If this will leave too thick a backing at the ends the *inside* surface of the backing strip can be planed down to proper thickness *before* the backing is glued to the main stave. This practice leaves the important outermost fibres intact.

An unbreakable bow—from the standpoint of splintering—could be made by backing the bow with a thin layer of brass or steel.

But this would not stretch perceptibly; and would force the entire bulk of the bow to act in compression. The advisability of such construction will be more fully discussed later in connection with other artificial backings.

THE YEW BOW IS ESSENTIALLY A BACKED-BOW

In the centuries-old search for suitable bow-timber one tree stands out pre-eminent—**yew**. It has always been preferred to all others. But, owing to the difficulty in obtaining satisfactory staves and the extreme care necessary in their fabrication, yew bows are expensive and must be classed as luxuries. There is, of course, **yew** and **yew**! Likewise there are **yew bows** and **yew bows**!

The **self-yew** bow is in reality a backed-bow,—in which the backing is provided by nature. Being a true *log-bow* it is usually crooked and marred by knots. But its cast is unrivalled by other materials.

The yew is a berry-bearing evergreen of the cedar family. Its outer layer is ivory white, while the heartwood varies in colour from a deep mahogany to a reddish pale yellow. It resembles a cross between fine-grained fir and red cedar. Its outer layer, or rind, which is seldom over half an inch thick, is extremely tough and has great tensile strength, like hickory. The inner wood is dense, brash, and splinters easily if bent alone. It is the combination of what really amounts to two different woods in one piece that gives the yew bow its admirable qualities. The outer layer stands the necessary stretching and protects the brash heart-wood which, in turn, stores up the compression forces, and springs back quickly when the constraint is relieved. Alone either would be useless, but acting together they form a wonderful combination.

A split of yew will often have a good strip of sap-wood, but will have a poor heart-wood portion behind it. Another stave will have sound heart-wood with a defective rind of sap-wood. In this event the two portions are sawed apart in each piece, and a first-class bowstave obtained by gluing the good sap-wood to the better heart-wood. In this manner we get the **yew-backed-yew** bow, which Ford ranked second only to the **self-yew**. Such bows are rare. It is more common to back the yew heart-wood with a strip of good hickory. The **hickory-backed-yew** bow results, which is a very fine bow if made right.

THE GRAFTED-BOW

Yew bowstaves of sufficient length for making six-foot bows of a single piece are comparatively rare. Billets from three and one-half to four feet long, however, are easily procured. Two such short pieces are therefore joined together at the handle in order to obtain a stave of proper length. The finest yew bows for target use are so made.

In joining two half-staves to make a **grafted-bow** the **double-fish joint** as shown in *Figure* 12 is used. This joint is completely hidden by the handle, the extent of which is indicated by the dotted lines. A long **single-splice joint** is comparatively easy to make and serves very well. It is a bit unsightly, but practicable, especially in joining two short pieces for cheap bows—where the cost of making the **double-fish** would be prohibitive.

JOINTED-BOWS

The **jointed-bow** is coming into widespread use. We much prefer the full-length bow; but the convenience in carrying around a comparatively short weapon is desirable. Nor can their efficiency be denied, since Dr. Crouch has used a **jointed-yew bow** exclusively. The bows shown in his hands in all pictures in this book are jointed-bows; so also are those pictured with Homer Taylor, *Frontispiece,* and Gen. Thord-Gray, *Plate* I.

Grafted-bows and **jointed-bows** should be made with a stiff mid-section and must not be worked so close to the handle as bows made from a single length. This gives the backing—which has been completely severed at the middle—sufficient anchorage to prevent the severe shearing stresses from splintering the bow at the grip.

Yew from high altitudes, where the growth has been slow, makes the best bows. Lowland yew is too soft and flabby, and a bow of enormous bulk will often be totally devoid of power.

The fine-grained yew, having many year-rings to the inch, has been preferred by archers. From our own experience, however, we believe this quality to be of value mainly from the standpoint of a collector's fancy. Good mountain yew having well-defined markings with comparatively coarse grain is just as good. Extremely fine-grained bows from nearly perfect staves are valuable rather because of their rarity than for shooting qualities. An ex-

FIG. 12. (A) DOUBLE-FISH-JOINT. (B) LONG-SPLICE-JOINT

quisitely beautiful bow may be an exceedingly poor shooter; whereas a knotty old dog-legged weapon may possess casting qualities of the highest order.

MANUFACTURED BOWS

If the beginner had to purchase a yew bow before taking up archery few indeed would be attracted as participants to the sport. Inexpensive bows must be marketed to satisfy a popular and inquisitive demand. For the popular-priced weapons we must use commercial or semi-commercial materials that can be readily obtained and made into serviceable bows with little or no regard to peculiarities of grain or texture.

Lumber-bows are made from sawed timber. Woods of fair bow-making quality with comparatively straight grain for considerable length can be sawed into staves and worked with machinery into bows, at comparatively little cost. No attempt is made to follow the grain, nor is heed given knots, cross-grain, sidebends or other blemishes. High-speed cutting tools go through the wood regardless of defects, and symmetrical, beautifully tapered bows are turned out. These can be given a splendid finish and look well in a dealer's display, but they are apt to prove very poor bows from a shooting standpoint.

The usual imported bows were so made from lancewood—a tropical hardwood, so-called because it was once generally used for making lances. These bows were customarily stained a rich brown in the body with the back left light, in imitation of self-yew. Lancewood is a tough, heavy wood of extremely fast cast and little tendency to chrysal; but it is hard in the hand, disagreeable to draw and shoots with a decided kick. It is also likely to shatter into a dozen pieces without notice. If backed with hickory lancewood makes a fair flight-bow, but for target purposes it is not desirable.

LEMONWOOD BOWS

The most serviceable wood for making low-priced bows for archers is another imported tropical wood called Degame, but popularly known as lemonwood, from the faint lemon tint of a freshly planed surface. This is a dense hardwood, difficult to saw but very easy to plane or cut with an edged tool. It has no noticeable grain

and can be worked quickly into shape. Lemonwood bows are immune from **chrysaling** and possess sufficient tensile strength in the back to resist splintering under moderate bending strains.

Lemonwood bows are not so quick in cast and are **heavier** in the hand than yew, but they are far less expensive. They have a smooth, pleasant draw and, when properly made, are free from kick or jar when shot. Their chief disadvantage is that they *follow the string.* However, once one has taken its *initial set* it rarely weakens further. The writer makes such bows under strain, so the set is developed evenly throughout the entire limb while the bow is being made. This results in a bow that loses very little poundage from its original weight.

Many very high scores have been made with lemonwood bows and some expert archers prefer a good lemonwood bow even to yew for tournament shooting—particularly where wide variations in temperature may be expected.

Lemonwood bows in excess of forty-five pounds are very likely to break if unprotected. If stronger bows are desired a **hickory-backed lemonwood** bow should be selected. Next to yew the writer prefers this combination, although elm backing is often used.

PROTECTIVE BACKINGS

The use of other materials than tough wood for backing is often met with. Rawhide has been widely used for this purpose. Thin strips of electrical fibre are commonly employed of late. This **protective backing** prevents the rising of small splinters and thus helps keep the bow from breaking. Such protection, however, is not infallible. We have seen too many bows break to know that such backing is any protection against abuse.

The addition of a thin *in*elastic artificial backing acts like the hoop on a barrel. By actually shifting the neutral-layer to the outer surface of the bow it tends to make the entire bulk of cross-section act under compression. Thus, on a yew- or hickory-backed bow, an inelastic outer layer of protective backing actually eliminates the desired reciprocal action of the two entirely different classes of material.

Experiments show that the addition of an inelastic backing increases the cast of a bow. It does, but at the expense of doing away with the reciprocal action that makes for smooth and easy

drawing. The additional cast is thus obtained by forcing the innermost portion of the body to stand greater compression than it normally would, often a stress beyond its critical or safe limit.

Where safety and insurance against breakage is particularly desired, protective backing is a permissible expedient; but for target-work the writer's personal preference is for the unprotected type of weapon, since he feels that the simpler weapon has a smoother action and is more pleasant to shoot.

BLEMISHED STAVES

In the past only first-quality staves have been used in the manufacture of archer's bows; but with the growing popularity of the sport a successful bowmaker who desires to continue in business must use an increasing percentage of imperfect staves. As perfect staves are sometimes impossible to obtain, it is becoming necessary for the bowyer to learn to handle blemishes and defects in lemonwood as the experienced maker does with yew.

GOOD BOWS DIFFICULT TO PRODUCE IN QUANTITIES

A well-equipped manufacturer of wood products often looks longingly at the market for expensive bows. They look so simple that he figures he can turn out first-class articles at low cost with his modern equipment. A supply of bow-wood is obtained and the foreman is turned loose with blue-prints and specifications. A fairly good model is produced. Then calipered dimensions are carefully checked, and a quantity of bows produced. Sporting goods dealers are sent price-sheets and quoted large discounts. Orders come in, and bows go out. But the good wood is used up first, and when repeat orders come in there is nothing left but unsuitable material to work with. Dealers in the meanwhile have been led to expect *perfect-looking* bows. And those with small knots or cracks are returned to the maker. Soon broken bows—due mainly to careless overdrawing—begin to drift in for replacement. Grief then follows and the factory soon returns to its real work of turning out ornamental objects, sash-doors, or balusters.

Bow-making is not susceptible to mass production. Good bows can only be made as individual specimens.

The experienced bowyer knows that it is the maker, rather than the stave itself, that determines the quality of the finished product.

In every stave there is a bow! And the man who gets it must appraise it carefully and get from it the very best bow that it will yield. This is particular work.

It appears that the quality of a bow-wood is in inverse proportion to its ease in working up. The long, straight-grained, easily worked woods are usually unfit for the purpose, and the superior woods normally come full of knots and other exasperating defects.

OTHER BOW-WOODS FOR THE EXPERIMENTER

For the experimenter many woods are available. Red cedar, if backed with hickory, makes a splendid bow; but if a strong bow is made from cedar it is apt to be easily chrysaled. Sassafras, locust, mulberry, osage-orange, iron-wood, used either as self-bows or with hickory backs, present themselves. Of these, however, mulberry and osage-orange are now considered the only real bow-woods. Osage-orange, or the bois d'arc, is a bow-wood of the highest order; but suitable staves are difficult to obtain and very hard to work. Osage-orange bows are desired by many archers for hunting; but for target purposes good yew is to be preferred.

LAMINATED BOWS

Another type of bow often met with is the **laminated-bow**, or one made from three or more layers of different woods. These different woods are also frequently separated by thin layers of coloured wood or compressed fibre, sandwiched in between the adjacent laminations.

The principal advantage of such "billiard cue" creations lies in their exquisite beauty. For decorative purposes they are unsurpassed! But from the standpoint of cast and endurance they are impractical.

The use of more than two layers of different woods, to make the standard **backed-bow**, is wrong in principle.

It is not wrong, however, to laminate bows at the handle. As the mid-section should not bend whatever, it is proper to add bulk thereto to an otherwise thin stave. Such stiffening may be of as many laminations as the fancy desires, but in no case should the *active portion* of the limbs be of such built-up construction.

In the manufacture of bows, as in many other lines of endeavour, the most efficient specimens are usually the simplest.

CHAPTER VIII

JUDGING AND SELECTING A BOW

Choosing a bow is largely a matter of cost. Good bows are hand-made and bring good prices. An experienced archer chooses a bow as a musician chooses an instrument. Bows also differ in characteristics, and particular archers use different bows for different purposes.

The beginner is advised to consult a more experienced friend if possible; otherwise let him buy an inexpensive bow that he can learn with and later discard for one better suited.

From the standpoint of cost, bows may be divided into three general classes:

(1) Cheap juvenile or toy bows,
(2) Medium-priced self-bows, and
(3) Expensive bows.

It is not easy to say just where one class begins and the other ends.

For archery purposes the cheap toy or juvenile bow is worthless. A fair medium-priced bow, costing between ten and twenty-five dollars, perhaps, should be obtained. Later a better bow can be acquired. A good bow is necessary, but a first bow should be of low cost for two reasons: (*1*) it serves as a temporary expedient for the time being, till new muscles are broken in and the proper tackle determined; and (*2*) it gives the archer a reserve bow to lend to friends. A fine bow should never be used by any one but its owner.

The archer who aspires to good scores will eventually obtain the best of tackle that his purse affords. Money spent for good equipment is wisely expended. Good tackle should be gotten early; still it is not necessary to invest heavily in expensive items to begin with.

Though the best of tackle is none too good one should realise that no one can become an expert archer through the simple expedient of collecting expensive bows-and-arrows.

In the category of expensive bows we place the better backed-bows and particularly the fine shooting log-bows that are the choice products of the bowyer's art. A good yew bow readily brings from fifty to one hundred dollars.

But a carefully made self-lemonwood bow of proper weight makes a good beginning.

In choosing a bow the two main considerations are (*1*) that the bow shall be of sufficient length to stand the correct drawing of the proper length of arrow, and (*2*) that it should be strong enough for the purpose intended. If these two considerations are satisfied, the bow, in addition, should be free from *uncared-for* defects, of sound wood, and properly proportioned. Its limbs should bend evenly when the string is drawn, and it should shoot without a jar. This may be determined by drawing the string back about six inches and letting it go. A slight but decided jar can be felt if the bow is a kicker.

Bows that are thin at the handle should be looked on with suspicion, as they are apt to be weak in the middle and bend in the hand.

Figure 6 and its accompanying text deal with the bending qualities and characteristics of various good and bad bows.

In considering what weight of bow to purchase the beginner is cautioned that, although the bow be of *sufficient* strength it must not be too strong.

Look for knots, pins, cross-grains and other defects—mainly to see that the maker took these, if present, into consideration. If such blemishes have been ignored, be suspicious of the bow. However, if you see plain evidence of allowances or corrections, to counteract—rather than to conceal—blemishes, the chances are that the bow is a good one. You will do well to avoid choosing a bow that savours too much of mechanical production unless near perfection in other qualities justify it.

Remember again that you shoot the arrow. Therefore, you should ascertain your correct length of draw and select a length of arrow shaft that will permit of proper technique in that respect. The point of the arrow, above all else, must not pass within the bow when you draw your correct length.

Having ascertained the proper length of arrow, choose a bow that will take the draw. It will be of approximately the same height as the archer. The bow, however, should be capable of

withstanding the *full-draw* of the arrow used, even though the owner habitually draws less than to the pile. This is a precaution against some one else who may take up the bow and draw the arrow through its entire length.

THE FULL-DRAW TEST

The salesman offering a bow for sale should be required to string it and then made to draw the proper length of arrow several times—*to full-draw*. If the bow stands this test it is safe to take.

No store can afford to guarantee bows against breakage once they have been taken out.

So the full-draw test should be insisted on!

After you take the bow out of the store—*it is yours!*

Take great care thereafter that it is never drawn beyond the point to which you yourself customarily draw it!

To the untutored it is the popular idea that a good bow will remain whole after being bent double. Consequently, if you don't watch out, a stranger will some day pick up your favourite weapon when you are not looking—and start to pull back the string as far as his reach or strength will let him.

If your bow is a short one, and his arms are long—you are soon apt to find a broken bow in your possession.

DANGER OF OVER-DRAWING BOWS

A good shooting bow is so made that the elastic-limit of its most strained fibres is reached at about the point of full-draw.

We cannot put too much emphasis on the danger of over-drawing a bow—whether you do it while actually shooting, or whether it is done elsewhere. A single over-draw is all that is necessary to wreck many bows, just as *one* fall from above the tenth floor puts an end to the career of many a promising window washer.

Read and take the following maxims to heart:

(1) Bows that are *underdrawn* practically never break.
(2) Bows *fully drawn* often break.
(3) Bows overdrawn almost *always break!*

To prevent meddlers from handling your bow, keep it in a cover of some kind when not in use. A soft flannel bow-cover is good

anti-breakage insurance, besides protecting the finish during storage or transportation.

Do not leave your bow out, either strung or unstrung, when not in use. Many bows are drawn by meddlers when the owner is not around. Frequently the meddler tests out his own strength rather than the drawing qualities of the bow. The string is drawn back until a slight warning *"cr-a-a-a-c"* is heard. And the draw is relaxed in time to prevent breakage *then*. But the unsuspecting owner is often vexed and chagrined when the bow breaks later—while he himself is using it.

Many an unfortunate owner never personally overdrew his bow. Yet it broke unexpectedly—and the usual search for the *defect* ensued!

Again, take warning! Always put your bow away in its cover.

If the bow is to be taken on a journey or out where there is danger of dampness or rain, keep it in a *waterproof case*.

LENGTH AND STRENGTH OF BOWS

To the uninitiated the longer the bow the stronger it seems to be. The opposite, however, is the fact. Bows are made long only for safety. We shorten a long bow to strengthen it and obtain a faster cast; but this must be done advisedly.

The strength or weight of a bow depends on the bulk of material left in the body. A long thin bow will be limber and weak in cast. A short, thick bow will be stiff, fast and strong. The weak, limber weapon may bend almost double without breaking. But the short thick bow may break before it can be braced, or strung.

Between these two extremes is found the general run of bows.

Appearance is frequently deceptive to the novice. Forget the looks of the individual weapon if you can. Choose the bow that *feels* the best. A bow should really be chosen blindfolded.

The higher-priced bows are carefully finished and polished as a rule; but their value by no means resides in that consideration alone. Exceptional shooting qualities were probably recognised in the rough staves, and the bows made upon them as the foundation.

A bow obviously should be varnished, polished or otherwise

finished, both to enhance its natural beauty and to protect it from dampness.

THE HANDLE

The handle should be stiff and unbending, but no hunk or unsightly excess of wood is necessary to secure this quality.

It is customary to glue a small piece of wood or other material on the back to fill out the flat side and make for a more comfortable grip.

The covering of the grip is of little importance. Plush is frequently used on the cheaper bows because it is easy to put on and looks well. A simple cord handle is as good as any. Common upholstery gimp-tape is often used. Split-leather, moulded and glued in place, is about as good a handle as can be found. Thin strip bamboo has a very pleasant feel.

So long as the grip itself is comfortable and firm the covering can be altered by the archer to suit his individual taste. The writer often covers whatever material is originally present with a piece of chamois, glued over it. This is comfortable and rough enough to afford a good hold. It is also absorbent and particularly adapted to a hand that dampens with perspiration.

A good bow is a symphony of simplicity. It is the work of an artisan. If strung up and viewed from several yards' distance the eye will see it as a whole. It will involuntarily run up and down the graceful limbs from horn to horn, never stopping to gaze at any single point. When such a bow is drawn the two limbs bend in graceful arcs, neither distracting the attention from the other.

This is the one practical test that will enable a novice to judge a bow fairly well. Simply look at it after it has been strung or braced, and watch it as some one else draws back the string. If something is wrong, even the unpracticed eye can spot the fact. It may take an expert, though, to properly diagnose the cause and tell specifically what the trouble is; but the fact that something or other is amiss will be apparent to almost any one.

Aside from the imperfections of nature that must be compensated for, anything that definitely arrests the eye is a defect. The unskilled bowmaker will nearly always leave a hunk here, an unsightly bump there, or fashion the limbs to bend in a sharp or uneven manner. The practised bowyer, however, leaves you noth-

ing but a graceful whole. Simple!—but the most bewitching implement ever known to man.

DEFECTS AND DEFICIENCIES IN BOWS

In selecting a bow one should differentiate clearly between **defects** and **deficiencies.** The former exist in nearly every stave, and must be compensated for. **Deficiencies,** however, may be of omission or commission.

The writer has made many bows, some of which have obtained

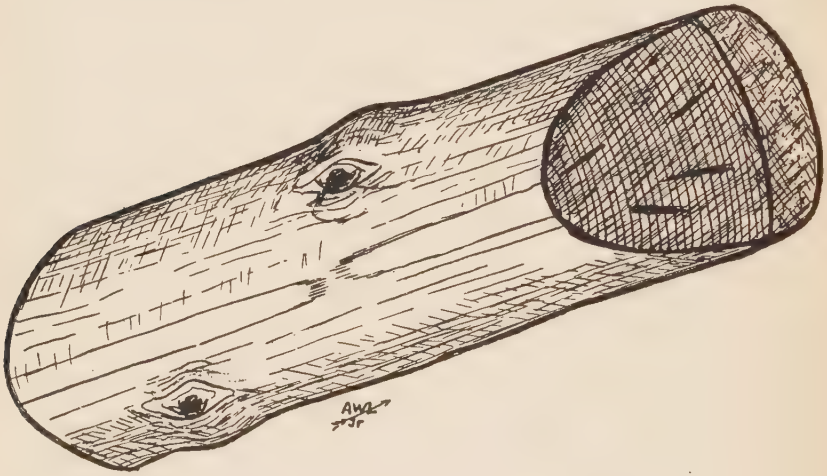


FIG. 13. RAISING A SMALL KNOT, OR PIN

national reputations; but he has seldom met with anything like the ideal stave. And, strange to say, nearly every bow of exceptional cast and shooting qualities came from a poor-looking stave. Bowstaves are like people. Those grown in protected localities, though beautiful to observe, are often weak and supple and lack character, whereas those that have had to struggle along for existence often come through, scarred and unsightly, but of tougher texture and more able to carry on with real burdens. (See *Page* 280, about Prof. Curtis' flight bow.)

Cross-grains at the mid-limb sections are to be avoided. In weak bows, however, moderate cross-grain is not so serious. Knots, pins and small worm-holes can easily be neutralised by **raising or plugging.**

The back of the bow is the most important consideration. If the back is good almost any defect in the body can be taken care of.

Look at the profile. If the outline of the back dips with any pronounced dips in the flow of grain, the bow is better for it. The great danger from knots in the body lies in pulverisation. Severe compression strains will eventually wear away the core of an unprotected body knot, and the bow is apt to break as the result of resultant pinching. To prevent this, the vicinity of the knot or pin is strengthened to resist this danger by leaving a

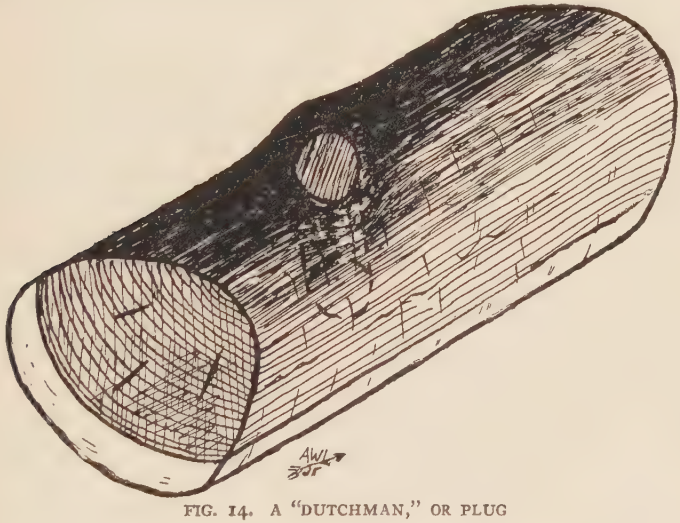


FIG. 14. A "DUTCHMAN," OR PLUG

small hump about the core,—raising, as the operation is called, as shown in *Figure* 13.

If the knot is a bad one it should be drilled out, as a dentist drills away portions of a decayed tooth, and a plug—known as a dutchman, of sound wood—glued in place, as shown in *Figure* 14.

Such compensation against common defects found in bowstaves, though strange to the uninitiated, if well done evidences superior craftsmanship in the art of making bows.

SEASONING AND WEATHER CHECKS

Many bow-woods are subject to checking, due to strains set up in the log while seasoning. Theoretically this can be avoided by

careful treatment during such period; but, practically, logs of bow-wood must be taken as they come—and the best possible use made of them, otherwise the average bow would be prohibitive in price.

Small weather or seasoning checks, running lengthwise along the bow, are not dangerous—so long as the plane of the split runs through the limb in the general direction of back to body. As a rule weather checks extend but a small fraction of an inch beneath the surface. Should one run out to the side of the bow it is apt to result in a splinter; but a wrapping of thin fishline at this point, properly glued and varnished, will largely eliminate danger.

Cracks running *across* the back or belly, however, are more serious. Pronounced cracks of this nature almost invariably foretell a broken bow.

Bows that are comparatively free from defects can only be turned out to meet the demands of a small market. With the development of a large popular demand first-class staves become harder and harder to get.

An experienced bowyer, instead of picking out his most select staves first, chooses at random and makes bows from each stave as he comes to it, getting out the best possible bow that each stave itself will yield. He may start with a stave that looks as though it would yield a fine six-foot bow, only to find as the work progresses that the best he can finish is a shorter or weaker weapon. Thus he soon learns from experience what he can and what he cannot do with individual materials.

As the professional bowyer's time is valuable he is not apt to waste much of it on a stave that will not come through and justify his care and labour. He must strike a balance between waste of time and conservation of material. Knots and pins mean more work, and, unless there is a reasonably good chance of obtaining a satisfactory bow he will not waste his time on a bad-looking stave.

Nearly every bowstave is "defective." If it is perfect in grain and appearance, it is likely to produce a supple and lazy bow. If it is tough and resilient there is apt to be an ugly knot or other blemish right in the middle of one limb. An excellent stave in all other respects may bend too much awry for a good lay-out. An otherwise perfect stave may have a bad split or cross-grain at one end. The bowyer must learn to contend with such difficulties—and the buying public must learn to know good work when they

see it, and not expect too much in the way of perfection of appearance in the material itself.

"BEAUTY SPOTS" IN BOWS

As production increases the less expensive bows are made from the poorer staves. However, so long as the bow is not excessively strong in proportion to length, a little care easily circumvents most danger of breakage due to the less glaring apparent defects.

Archers often take pride in possessing an efficient but deformed bow. A nicely raised knot, a pronounced dip in the profile that takes proper cognisance of the grain flow, or a dog-leg, are termed

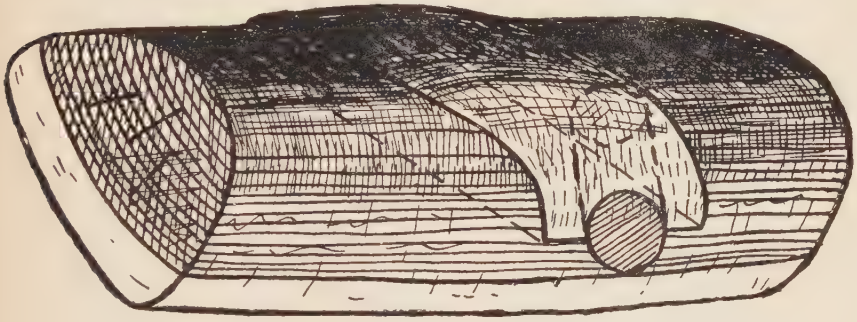


FIG. 15. A BAD "DOUBLE DUTCHMAN"
Note that the *Back* is Sound!

"beauty spots" and often come to be looked on with a sort of affection.

The writer has a thirty-nine-pound osage-orange bow that has a bad knot in both limbs, several small ones at most inconvenient places, a pronounced "dog-leg" near the extremity of each limb, a double "dutchman" like that shown in *Figure* 15, clear across the body about four inches below the upper horn, and a most awkward knot at the handle. The contour of the bow when unstrung is said to resemble a "snake with a bad case of colic." Yet the bow was made around these defects, and after three years of service remains the fastest casting bow for its poundage and length that the writer has ever handled. Its natural *point-of-aim* at sixty yards is well below the target.

We speak herein both from the viewpoint of archer and manufacturer, and are mainly interested in educating prospective archers

in what to reasonably expect and look for, particularly in the selection of bows.

The essential quality in a bow is not—whether it is a perfect specimen in every respect; but, rather, have any inherent defects encountered in the stave itself been properly cared for!

If the bow under consideration shows evidence of proper treatment in respect to these minor defects, if it feels right, if it is not too badly awry, and, above all, if it stands the full-draw test at the hands of the salesman, it may be taken with little fear of breaking—unless it is later overdrawn or otherwise mishandled!

EASY AND HARD DRAWING BOWS

Bows are also easy or hard to draw. The easy-drawing bow is best suited for target work. By easy-draw we refer to the quality of drawing to within a couple of inches of the fully-drawn position

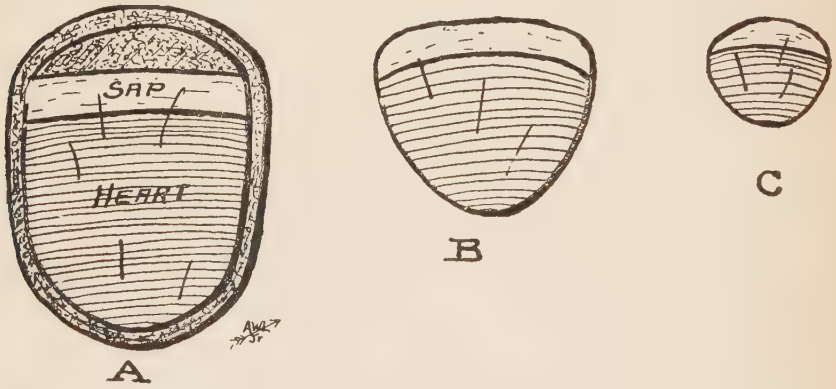


FIG. 16. TYPICAL CROSS-SECTIONS
(A) Through the Grip.
(B) About Mid-limb.
(C) Last few inches.

before the real weight of the bow is felt. The hard-drawing character of the usual hardwood weapons make them extremely undesirable. The fine silky-draw of a good yew bow makes it a pleasure to shoot. The easy feel of a good lemonwood bow, as well as its cast and freedom from chrysaling, is largely responsible for its great popularity as a substitute for yew.

For extensive target use a bow that draws easily for the first eight or ten inches before it begins to tighten up enables the archer

to get fairly well set for aiming before the fingers of the drawing hand are put under excessive strain. The best bows do not assert their full weight until the last inch or so is drawn. However, such bows must be drawn and loosed with absolute precision for accuracy. With the hard, stiff drawing weapons, exact length of draw is not so imperative.

FLAT AND STACKED BOWS

Bows that are flat and thin in cross-section are less apt to break than those that are narrow and deep. The narrow and deep bow, to a certain degree, has a faster cast. The mean between the two extremes in this respect is best in most cases. *Figure* 16 shows the typical cross-section through the handle, at mid-limb and at the last few inches of a target-bow. *Figure* 17 shows the

(A) (B)

FIG. 17. (A) WIDE FLAT BOW. (B) A DEEP-BODIED, OR "STACKED," BOW

difference between a typically wide bow and a narrow, deep-bodied bow, known as **stacked.**

The back surface, theoretically, should be left flat. It is in this outermost surface that we must have the maximum number of protective fibres to keep the bow from breaking. In log-bows, however, this outer layer is slightly rounded, in proportion to the diameter of the tree. To keep this layer intact we leave the back slightly rounded instead of perfectly flat. With lumber-bows the back is usually planed perfectly flat; but the edges should be rounded, since sharp edges are sources of weakness.

CONCERNING THE WEIGHT OF A BOW

Many amateur bowmakers imagine that *weight* in a bow is a true index of cast. Therefore, they reason, to get a faster bow

it is only necessary to increase its poundage. To a great extent this is true; but beyond a certain limit nothing is gained by the added "strength."

The heaviest arrow used for target work is the five-shilling shaft. In grains this weighs 433 2/3—slightly less than one ounce. Most archers prefer lighter arrows, particularly for use at the longer ranges—80 and 100 yards.

A fifty-pound yew bow of good quality will drive a five-shilling arrow at just about the maximum velocity possible to obtain with this means of propulsion. The use of bows drawing in excess of fifty pounds for target-shooting at 100 yards or less, we believe, is unnecessary. The use of bows drawing in excess of fifty-five pounds can usually be appraised as affectation.

Beyond a certain point faster cast is impossible! The material of which a bow is made has a certain maximum elastic-limit. If the fibres are worked in excess of this point, the cast is decreased with additional weight. For this reason excessively deep or unduly stacked bows are inefficient.

Many amateurs and not a few professional bowmakers still imagine that so long as the back holds they can make the body deep and increase the weight of a bow to any desired amount. They can! But in so doing they actually sacrifice cast. The inmost fibres or particles in the body will stand just so much crushing and retain the resiliency with which nature endowed the material. If this point of elastic-limit is exceeded—a breaking down of structure results, either in chrysals or useless packing.

Let the reader stand in the middle of the floor and jump upwards from a standing position. He can rise a few inches by merely snapping back the knees and rising sharply on his toes. By bending the knees slightly he can increase the height of his jump. By squatting momentarily to a semi-sitting position he can jump still higher . . . but there is a limit! If he squats still lower his muscles have been stretched beyond the elastic-limit, and any lower squat will only result in lesser leaps.

The same principle applies to the elastic and resilient qualities of the bow.

It is the speed of the horns or tips of the bow that determines its cast. For every piece of material we find this maximum speed. Additional weight will not increase the cast, once the maximum speed of the material itself is reached.

The real art in bowmaking lies in completing the weapon so that this point of maximum resiliency is reached at just about the position of full-draw.

Any overdrawing of this point only reduces the actual cast; therefore the only effective way to make a bow weigh more—is to increase its *width*. This amounts virtually to putting two bows together, side by side, and shooting them with a single string. Added speed is not attained; but *such a bow will shoot a heavier arrow.*

DESIRABLE WEIGHTS FOR TARGET-BOWS

For hunting-bows, where heavy arrows are used, bows weighing from seventy-five to one hundred pounds are necessary. But for target use such terrible weapons are ridiculous.

Flight-bows are ordinarily made very *heavy*. But experience has shown that after the first few shots the loss in cast is considerable. In making a target-bow, we wish a bow that will retain its original cast over a period of years, even though it may be shot several hundred times in a single afternoon.

In support of these contentions the writer gives some personal scores made with five-shilling arrows, from bows that drew between forty-five and forty-eight pounds. (See *Page* 120.)

In choosing a bow men are apt to err on the side of too much weight, whereas women choose too little.

Most men at the beginning of an archery career are afflicted with the desire to pose as users of supposedly *he-man* equipment. They glory in their supposed ability to use a fifty-five- or sixty-pound bow.

But for target-work with its exacting requirements we contend that the use of such unusually heavy bows is not only ridiculous—but pernicious, to say the least.

Let the prospective archer study the questionnaire, *Figure* 44, in which the methods of the leading archers at the 1928 National Tournament is analysed. The three leading archers used bows of less than fifty pounds' draw. Mr. Palmer, the champion, who formerly used a fifty-two-pound bow, used a forty-four–forty-six-pound bow at this tournament—and made a championship score within a few points of the highest ever recorded for this event.

Palmer had undergone a serious major operation several months

before and never expected to be able to draw the bow again. However, he recovered sufficiently to renew participation—but was forced to adopt very much lighter bows. His machine-like regularity at the tournament drew frequent comment. He later attributed this to his having practised extensively with bows drawing less than forty pounds, with which perfection of the loose is absolutely necessary for accurate results.

At the same tournament the present writer used a yew bow that drew little better than forty-two pounds for the second York Round.* His score of 113-551 for this round was the highest of the tournament. It was shot in the rain and came within fifteen points of equalling Dr. Henry B. Richardson's official American record of 116-566 made at Chicago in 1910. The day before, he shot the first York Round with a fifty-pound bow that gave a slightly lower point-of-aim—but the lower score of but 93-411. In view of the closeness of the match, we firmly believe that had we used the weaker bow, with which we finished out the tournament, on that first day, that we would have easily won the championship. The reason for the wide discrepancy in the two scores was that on the first day we fell for the temptation to use a lower point-of-aim, whereas on the second day we used a bow that was under absolutely perfect control.

A fast, low-flying arrow is of great advantage; but speed of shaft is not everything. Archery is a matter of *eternal compromise*. The overbalancing of one factor at the expense of another produces only inefficiency—and *lower scores*.

An archer must realise at the outset that the real exertion is done with the ends of the three fingers of his *drawing-hand*, not the biceps. Target-shooting is an hour-consuming sport, and during a session the archer may hold and loose several hundred shots. The experienced archer usually gets better and better the longer he shoots; but the person who uses more bow than he can really handle soon begins to get worse and worse.

The writer can use a sixty-pound bow with perfect ease and control—for a few ends. But he has made all his best scores with bows drawing well under fifty.

Few men should take up archery with bows drawing in excess of from forty-two to forty-five pounds. No matter what the muscular powers elsewhere may be, the novice must develop his

* This bow is shown in the pictures of *Plate* V.

MRS. S. R. ARMITAGE
English Champion, 1914

MISS V. M. RUSHTON
English Champion, 1927

MRS. ATKINSON
English Champion, 1928

PLATE II. THREE CHAMPIONESSES OF ENGLAND

loose before he can progress. A forty-pound bow will give plenty of cast for any distance up to sixty yards—the extreme range of the American Round.

BOWS FOR WOMEN

Women as a rule are clumsier than men when they first attempt to shoot. They are also more self-conscious and imagine that their performances are being closely observed. These factors seem to impel them to choose bows that are too weak. With a little practice, however, women can learn to handle the weapon properly and catch the knack of drawing. A bow that seemed too strong at first later appears to have weakened.

Ladies of average strength seem to find bows of from twenty-six to twenty-eight pounds about right. However, such bows are really too weak for the extreme range of sixty yards shot by women. The writer believes that more women could handle bows drawing from thirty to thirty-five pounds if they so desired, without undue strain or fatigue. These few additional pounds would be of inestimable advantage at their fifty- and sixty-yard shooting.

Although ladies habitually use twenty-five-inch arrows with five and a half-foot bows, there is no law to prevent taller women from using taller bows and shooting longer shafts.

SEX AND STRENGTH IN ARCHERY

Strength is just as much an advantage in archery as in other sports. But strength alone is never a substitute for skill.

Although men have always surpassed women in scores of record nature, many women can outshoot the great majority of men. Sex and physique are of perhaps less consequence in archery than in any other competitive recreation. Several women archers in the United States have turned in records that have only been surpassed by comparatively few men.

At the Grand National Archery Meeting in England in 1927 Mrs. R. Sanford, shooting with the men, won third place with a score of 145-685 for the Double York total. Mrs. Sanford, on the basis of that score, would have won tenth place at the National Tournament in this country, at Cambridge, Mass., the same year—in a field of over fifty men.

CHAPTER IX

CARE OF THE BOW

Care of the bow resolves itself under two heads: (*1*) care of the bow while shooting; and (*2*) care of the bow when not in use.

The principal care of the bow while in use is to **see that it is never overdrawn!**

We have mentioned this before, and can do no better than impress this fact on the mind of every archer again and again. In regard to this the remarks on *Page* 63 should be read and reread, and taken to heart.

TO STRING THE BOW

To string the bow properly:

(1) Grasp the bow with the right hand firmly by the handle, with the flat side, the *back*, uppermost.
(2) Place the feet with heels together, toes pointed out at a right angle.
(3) Move the left foot about twenty inches in the direction that it points. Bend the left knee slightly.
(4) Place the lower horn *against* the instep of the *right* foot.
(5) Put the open palm of the *left* hand against the upper limb, with the first two fingers pushing the loop toward the upper nock.
(6) Bend the bow by drawing it in with the right hand, at the same time pushing away with the base of the left palm.
(7) Work the loop up toward the upper nock as the bow is bent, and slip it finally into place.

The proper position to take in following these directions is shown in the lower left-hand picture on *Plate* IV.

Unstring the bow in the same manner.

There is a knack to stringing a bow, particularly a strong one. It is more a test of skill than strength.

Under no circumstance should the lower horn be rested on the ground and the bow strung by pushing it down or by bending it

with the knee. The horn is easily broken and, as one limb is apt to be bent in greater proportion than the other, the bow itself is endangered.

Always watch strangers and do not let them handle your bow unless you are certain they understand what they are about. The average person will invariably try to string a bow in an awkward and dangerous fashion.

While attempting to string, or brace, a strong bow take care to keep the fingers from getting caught in the eye of the bowstring. If the foot should slip or the grip give way, with the fingers thus

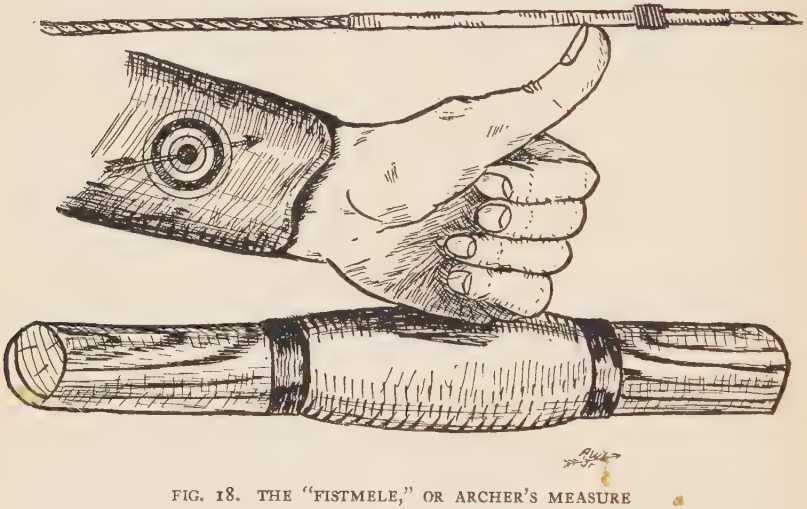


FIG. 18. THE "FISTMELE," OR ARCHER'S MEASURE

snared, serious injury, even amputation, might result. If the bow is too long or too strong, get some one to draw the eye into place for you while you exert your energy in bending the bow.

In stringing a new bow for the first time, or an old one that has long been unused, take care! If the upper limb should break during the act the broken bow is likely to spring back and inflict serious injury to the face or arm. The writer once received a painful gash in his left forearm, when a new bow broke as it was being strung for the first time.

A new bow, also an old one that has not been used for some time, should be strung with care and broken in by gently drawing and relaxing the bowstring for progressively longer and longer draws, until the full-draw position has eventually been reached.

A very old bow should be thus reworked in with extreme care, particularly if it has been subjected to drying.

The body of a bow undergoes wonderful aging during a period of dry storage, but the back is apt to have lost its tensile strength to a considerable degree.

We recently broke a splendid old yew bow that had been in a friend's family for over twenty-five years. The string was still in perfect condition. The bow was strung up and drawn back about ten inches—when it "exploded." Since that experience we have regarded old bows mainly as relics.

If it is desired to recommission old bows, it is a good plan to scrape off the old varnish from the back and wet it well with warm water. When dry, give the back a coating of thin oil and let this soak in. Revarnish later. This treatment will lubricate and resoften the fibres, reconditioning them somewhat so they will again withstand the tensile strains set up in that portion of the bow.

When properly strung the bowstring should be about six inches from the body. This distance is subject to individual variation within certain limits.

THE FISTMELE

The time-honoured method of gauging the proper depth of string is the *fistmele,* which is shown in *Figure* 18.

Under no circumstance should the bow be understrung, or with the distance between string and body too small; otherwise painful bruising of the wrist will result.

Bows that are high-strung show less tendency to shoot to one side; but as high-stringing produces the same effect as overdrawing it should be done, if at all, with due regard to the safety of the bow.

High-stringing a weak bow will add somewhat to its cast.

The bow should be kept well polished at all times. If it has been varnished with a good flexible varnish there is little to fear from an occasional wetting, provided the bow is carefully wiped and dried after reaching shelter. No one is apt to practice in rainy weather, but an occasional shower will overtake the archer. In tournament shooting it is frequently necessary to finish out a round in the rain. Afterwards, as soon as possible, dry and polish

the bow. It is advisable to carry some light machine oil and a rag in the kit for such emergencies.

Many archers adopt the practice of unstringing their bows between ends—"to rest the weapon." If any overconscientious archer obtains mental or spiritual comfort from this practice, let him continue to do so! Personally, however, we string our bow when we begin to shoot, and unstring it only when we have reason to believe that the shooting for the time being is over. At tournaments the writer habitually practises between the morning and afternoon sessions, and it is not uncommon for his bow to be strung all day.

THE BOW IN HOT WEATHER

Another supposition is that yew bows lose considerable cast in hot weather. To a great extent this *is* true, and we subscribe to the fact. But it is the *superstition* in regard to the extent of "going down" that we refer to.

Yew-wood is composed of alternate layers of cellulose and resin. In cold weather the so-called resin hardens and the bow becomes stiffer and stronger. In extremely hot weather the resin becomes soft and the bow loses strength altogether. Between these extremes, however, are found the usual shooting temperatures.

If the thermometer soars into the high nineties yew bows become exceedingly flabby. But at lesser temperatures there is little need for worrying. On moderately hot and humid days it is often very disagreeable to shoot, particularly at odd moments when the hot sun breaks from behind clouds, to beat down with full intensity. At such times it is usually the *archer* who wilts. But it has long been customary to blame the resulting inaccuracies on the "going down of the bow."

It takes considerable time for the bulk of wood that composes a bow to assume minor changes in temperature, and it is fairly ridiculous to suppose that even yew is sensitive enough to respond to temporary fluctuations, incident to the day's shooting, with the rapidity of a thermostat.

At the 1925 National Tournament at Rome, N. Y., the weather was unbearably hot through several days of shooting. The archers who used yew bows did find great difficulty in reaching out, particularly at 100 yards. The thermometer remained well over ninety

on the field during most of the shooting, and blistered necks and arms attested to the fierceness of the sun's rays. The yew bows were down and there was no question about it!

Two years later, at Soldiers' Field, Cambridge, Mass., conditions were quite different and varied on the one good day of the tournament. There was a tricky wind, great humidity during the middle of the day interspersed with an occasional burst of very hot sunshine through the clouds. Shooting began at nine o'clock in the morning and ended at seven-thirty that night. Considerable changes in temperature were experienced, if we remember correctly. Still the thermometer itself did not register anything like "blood heat." On this occasion we distinctly recollect the many vociferous complaints of bewildered shooters nearby who continually blamed their yew bows for "going up and down" with every passage of the clouds. In no other way could they seem to account for the extraordinary number of misses they were getting!

During this period the writer's point-of-aim at 100 yards rested conveniently on the top of a distant telephone pole. Throughout the day he made numerous lateral corrections in an endeavour to outguess the wind, but if his own yew bow "kept going up and down" perceptibly during the day he was not aware of the fact.

In our opinion temporary dampness or humidity does not affect the cast of a bow if it is finished with a waterproof polish or varnish. Long exposure to dampness probably will, as no paint or varnish is 100 per cent proof against absorption. But under the customary shooting conditions temperature and temperature alone is the chief cause of any variation. Humidity, however, very quickly affects the *archer,* particularly if he is subject to profuse perspiration; but the bow gets the credit for his misses!

The best wood arrows are also subject to slight variation in spine just as the bow is subject to changes in cast. But this variation is also likely to be overestimated if allowed to become a popular bugaboo.

So long as the bow feels *cool* to the touch we feel that it is sufficiently good in cast for reliable shooting. If it feels warm or hot, then the temperature is above "blood heat" and it will be exceedingly flabby. But, as a general rule, archers choose more temperate days to do their shooting.

At tournaments, where the rounds have to be completed in time,

regardless of weather conditions, if exceedingly hot weather is to be expected the use of a hardwood bow or of a steel bow can be resorted to.

It is unwise to shoot a favourite wooden bow, particularly if it be a strong bow—forty-five pounds or more—in winter. The back fibres become brittle in cold weather and are easily broken. If it is necessary to shoot when the thermometer is below, say 45° F., be sure to use a bow that still bends without beginning to bind at full-draw—or be content to draw the regular bow an inch or so less than normal.

CARE OF THE BOW WHEN NOT IN USE

Put your bow away in a dry place, and always in a cover of some kind to keep meddlesome hands away. Read again the remarks on this subject back on *Page* 63.

If stood on end, take care that other objects cannot fall against the bow. Keep your bow well polished and wipe it off frequently with an oiled rag.

The safest way to put your bow away is to hang it up. However, aside from the danger of injury due to carelessness there is nothing derogatory to standing the bow upright in a corner. The notion that a bow stood on end "gets tired" and bends out of shape is another superstition!

A little reasoning will show that a bow suffers more abuse during a single draw than it would from standing upright for several months—so far as weakening in the limb is concerned.

Bows do warp out of shape from standing around, however; but this is due to the fact that they were put away before being properly seasoned—made from unseasoned staves—or else stood where the temperature on one side was materially different from that on the other.

STORING BOWS

Bows in storage should be kept in a cool dry place—where there is good *circulation of air on all sides*. Under no circumstances should they be left near steam-pipes, radiators, stoves or other sources of artificial heat. Store windows are excellent places to display archery goods—but poor places to keep such tackle in

good condition, particularly if the window is on the sunny side of the street.

Always *unstring* your bow when you put it away.

To keep the bowstring from slipping down the upper limb, a keeper—a loop of string or ribbon—is passed through a small hole in the upper horn and adjusted to keep the string up along the bow when the latter is not braced.

As discussed in the following chapter, on *Page* 92, the bowstring, particularly on strong bows, should receive constant attention.

Yew-wood is very soft and care should be taken to prevent bruising, particularly in the body of yew bows. Hardwood bows are not so susceptible to injury from rough handling.

WRAPPING BOWS

Many archers wrap their bows at intervals with bands of fishline for "protection." The writer has broken too many bows so treated to put much faith in this as a general practice. But if a splinter is detected in the act of rising, it should be glued down and thus wrapped. And any splitting out on the side should receive this attention. A bow that is patently doomed from an inherent weakness, however, is going to break, regardless of any artificial protection that is not more serious than the cure it supposedly effects.

As a rule any localised damage to the body, or inner portion of a bow, can be repaired or nullified by inserting a "dutchman," or short length of sound wood, as a patch—so long as the back itself is sound. But once the back itself begins to go there is little hope for the bow. In some instances a repair can be effected that will stand if the bow is weakened; but that destroys the bow in so far as its original qualities are concerned.

In general, care of the bow is simply a matter of common sense and nothing of a mysterious nature.

A bow that has lost part of its cast during a long period of shooting will recover its usual strength if unstrung and put away. Bows are subject to fatigue, the same as their owners.

After unstringing a bow, particularly on a hot day, you may bend it back *slightly* to help relieve the pent-up tension in its fibres; but under no circumstance should you carry this operation to the point of attempting to straighten the bow from its condition of permanent set.

At organised archery clubs the members are usually provided with cupboards or lockers for their individual equipment. These are tall enough to allow of putting away the bows in upright position, and have compartments for arrows, quivers and other paraphernalia of the archer. Such a cupboard is termed an *"ascham"* in honour of the famous author of *Toxophilus*.

CHAPTER X

THE BOWSTRING

A fine bowstring is almost as difficult to produce as a good bow. Many materials have been tried for this purpose, but the most practicable is good flax.

Cat-gut is not used for bowstrings.

The best bowstrings come from Belgium, where their manufacture has been carried on by single families for many generations. The methods used to produce the best Belgian strings are kept secret.

During the World War the supply of bowstrings was cut off, and it became necessary to manufacture strings in this country. Accordingly, some very good strings are now made in the United States; but they are not generally up to the standard of the imported variety.

Metallic bowstrings have often been tried. Such strings made from twisted steel wire will shoot; but the action and feel is anything but agreeable.

First-class bowstrings are very difficult and tedious to make. Consequently a real good bowstring will cost between one and two dollars.

The usual American strings are produced from fine, loosely spun flax thread, such as the old shoemaker used in the days of hand-sewing. The main portion of the bowstring will consist of from thirty to sixty or more threads, according to the weight of bow on which it is to be used. The ends are made of double thickness, to withstand the friction against the nocks. The usual American bowstring is put together, or laid, with beeswax.

A good quality bowstring has extreme strength, but little bulk. One less than one-eighth inch in diameter will often bear the weight of a man.

Good wearing qualities, freedom from rot and other deterioration, due to normal exposure, and absolute lack of stretching are

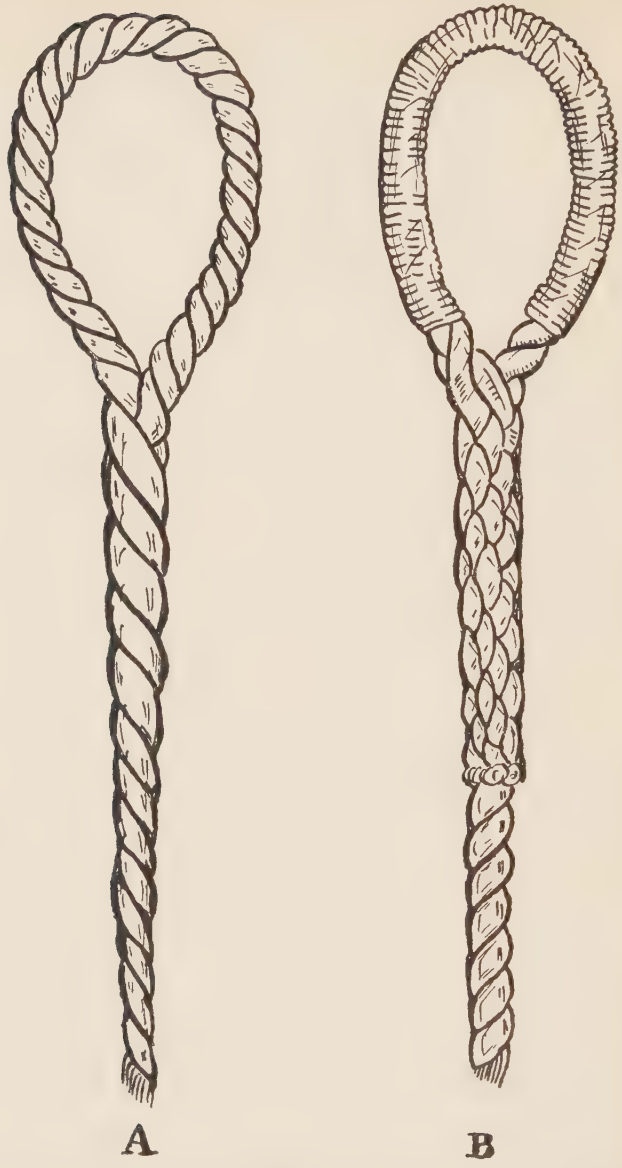


FIG. 19. (A) HAND-MADE BOWSTRING WITH WOVEN EYE. (B) CORD BOWSTRING WITH SPLICED EYE

imperative. The ordinary cotton and hemp twines and cords are useless. Chalk-line is worthless, since it stretches too easily.

Various grades of Italian hemp and manufactured flax cords are used in stringing cheaper commercial bows, with fair success if the bows are not too strong. In these the **eye** is **spliced**, rather than **woven**, and is wrapped or **served** with thread to prevent wear at the nock. Cheap bowstrings may also be "served" or protected from wear at the eye by slipping a short length of tubular fabric or "spaghetti," such as is used in wiring radio sets, over the end before the eye-splice is made.

The difference between the best grade of bowstring and such a manufactured cord, having a spliced eye that is served with thread for protection, is shown in *Figure* 19.

The best bowstrings are laid in a glue sizing instead of wax. They are hard and sing like harp-strings when plucked or tapped with an arrow. By wedging an empty tin-can between the body and bowstring at the lower end of the bow, a sort of sounding-chamber is obtained, and recognisable tunes can be played on a well-strung bow by tapping the string with one arrow while another is run up and down the string after the manner of "fingering" the steel-guitar. This contraption might be looked on as an ancestor of the fiddle.

We have always made our own strings, which are sized with a special mixture that leaves the cord hard and round.

An archer who learns to make his own strings and who has the patience to do so can reduce the cost of his shooting appreciably. It is no easy job, however, and calls for much skill and cleverness.

Directions for making good bowstrings are to be found in available works on making archery tackle.

The bowstring should have a loop at the upper end. The **eye**, as this upper loop is termed, should be large enough to slip easily in place and out again when the bow is strung or unstrung. It must not be too large, or it will permit the string to slip off the nock when the bow is drawn. If the eye is too large it may be closed by serving it securely at the throat.

THE TIMBER-HITCH

The lower end of the bowstring should be permanently fastened in place. A very simple knot known as the **timber-hitch**, shown in *Figure* 20, should be used to make the **loop** for the lower end.

FIG. 20. THE TIMBER-HITCH

This knot will not slip or come loose, yet can be readily opened for readjusting the length of string.

Commercial bows are often provided with bowstrings that have eyes at both ends, and many archers prefer this **double-eye.** Theoretically it is a good idea, but practically it is not so desirable. If such a string is a trifle long or short it cannot be properly adjusted. Twisting the string to shorten it, as is often advocated, *should not be done!* This is apt to cause kinks. At best it tends to loosen the serving at the middle. To readjust a string always take it off and retie the timber-hitch to suit.

In an emergency it may be necessary to rob one bow of its string to replace a broken or frayed string on another. In such an emergency the undesirability of the double-eye is self-evident.

SERVING THE BOWSTRING

A good bowstring must be *served,* or wrapped at the middle. This builds out thin strings so they will not cut into the drawing-

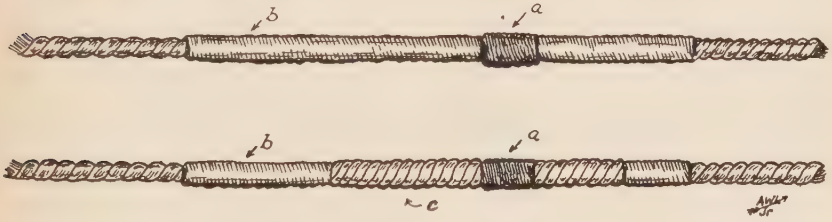


FIG. 21. SERVING, OR LAPPING, THE BOWSTRING
(a) The Nocking-point.
(b) The Serving, or Lapping.
(c) "Padding" for Tender Fingers.

fingers too deeply. It also prevents wear as the string in action slides against the forearm or bracer.

The serving on the string of a new bow should be examined to see that it is properly done and correctly located. The serving on a new bowstring—unless made particularly for the bow on which it is to be used—is often too far down or too high up. Always examine such strings and correct the serving if necessary.

Various materials have been used for serving bowstrings, some with the idea of providing a smooth, hard surface—to insure a cleaner and smoother loose. In this category we have thin strips of whalebone, compressed fibre, vellum and others. Personally

we have never been addicted to any of these fancy materials, since we think any advantage in cleaner loose that may be gained (problematical) is at the expense of reliability. Such serving is too apt to come loose during a match and an immediate repair under the circumstances is well nigh impossible.

We prefer a simple wrapping of heavy carpet or button thread, well waxed and tightly wound in place, as shown in *Figure* 21. This will not come loose without ample warning, and can easily and quickly be repaired if it does.

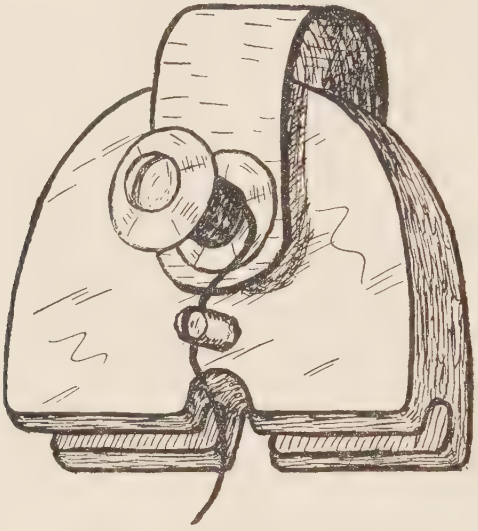


FIG. 22. BOWSTRING SERVING-DEVICE

Some archers advocate serving the bowstring with a double or triple thread, usually in different colors. This looks good and is said to prevent broken bows, since the three threads are "strong enough" to hold back the parted ends of a broken bowstring sufficiently, to damp the recoil of the freed limbs enough to save the bow. This may be so with weak bows, but we think it has little safety effect on a strong one, so prefer the simple one-thread serving.

The serving or lapping should extend from a point well above the position of the upper drawing-finger on the string—to about even with the bottom of the grip. It is better put on when the bow is braced, and should be examined frequently and replaced whenever there is the least evidence of loosening or wear. Watch

particularly at the nocking-point. Carelessness or laziness in this regard will result in shortening the life of an expensive bowstring —with great danger to the bow.

Many archers construct small winding-devices that enable them to serve a bowstring in a few minutes. A simple device of this nature is shown in *Figure* 22.

THE NOCKING-POINT

Make the string fit the nock of the arrow snugly but not too tight. As the string on a target-bow is nearly always smaller than the nock of the arrow, even after the string is served, the exact position of the nocking-point should be ascertained and built up with an additional serving of fine thread. For this we use thin sewing-machine linen thread. It is wrapped on in sufficient layers to suffice, plenty of wax being used to hold it in place.

The arrow should fit on the string just tight enough to hang of its own weight.

Serving at the nocking-point should be checked frequently and ought to be replaced if necessary before each day's shooting. This operation is also illustrated in *Figure* 21.

If your string is too thick for the arrows, their nocks must be widened. Many archers carry a flat file of proper thickness for this purpose, and file out the nocks of all new arrows to a uniform width and depth.

As a rule, though, the string must be built up at the nocking-point to fit the arrow.

Many arrows are split at the nock, particularly by beginners, in trying to force an arrow with too narrow a nock onto a thick bowstring. So guard against this, and file out the nocks of new arrows if necessary.

PADDING THE BOWSTRING

If your drawing-fingers are tender, drawing is painful, the loose is apt to become bad, and flinching results. Thicker finger-tips or a heavier shooting-glove will remedy this. But finger-protection that is too thick is hard to feel through, therefore bad. To obviate this—the bowstring itself may be padded, or enlarged in diameter just outside the nocking-point.

A padded drawing-portion of the bowstring is shown in the

lower sketch of *Figure* 21. We have often used this protection to protect tender fingers at the beginning of the season, or after a long period of rest.

Any serving, or lapping, of the bowstring should be done in opposite direction to the twist of the cord itself, or of any layer of serving beneath the one being put on.

WEAK BOWSTRINGS DANGEROUS TO BOWS

A broken bowstring may mean a broken bow!

It pays to guard against this mishap.

If the string breaks after the arrow has been released, no danger is imminent; but if the string parts while the bow is fully drawn—the bow will almost surely break, particularly if it is a yew or backed-bow. In this event the two drawn limbs have nothing to restrain them. They fly past their initial position of rest. The force of inertia is so great as to take them into a badly-reflexed position. This reverses the relative strains in back and body—just as if the bow were bent or strung up backwards, and a broken bow is nearly always the result!

The writer lost his favourite yew bow about a year ago, when a frayed string, that he should have replaced, parted.

CARE OF THE BOWSTRING

If you intend shooting at a tournament or other important match—have a spare string, already adjusted, ready to slip on the bow in an emergency.

Bowstrings should be kept coiled, in circles of not less than three inches in diameter, when not on the bow. Sharp doubling, particularly with glued or other hard-sized strings, must be avoided.

Do not hang up your bow by the bowstring, or put your bow down where the string can come against any sharp edge. You may fray the string slightly, enough to seriously weaken it and endanger the life of your bow.

Wax the bowstring frequently. Good beeswax, or a mixture of beeswax and resin, is satisfactory. After waxing rub down the string with a bit of smooth leather, to work the wax into the string and leave a smooth hard cord.

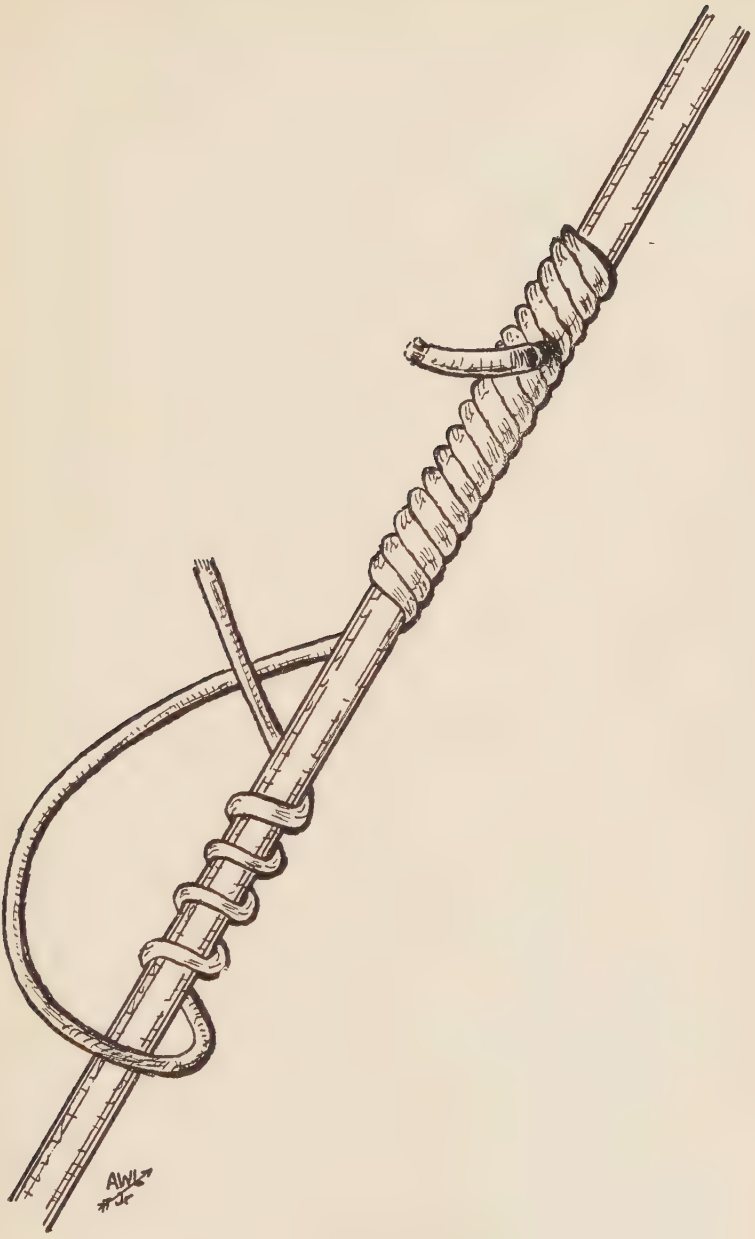


FIG. 23. THE END-KNOT

Keep the wearing surfaces at the nocks well waxed at all times, to prevent frictional wear.

A thin light bowstring will allow a much faster and livelier cast than a heavy one. Conversely, a heavy "rope" will slow down a fast bow. A mean between these extremes is desired. If a light string is preferred it must be watched carefully and changed often. A good safe string may be a bit slower, but it will last several months with ordinary care, and insure against breaking the bow.

Changing from a light to a heavy bowstring, and *vice versa,* will affect the flight of an arrow. It not only affects the elevation but also the relative tendency to shoot straight.

Figure 23 shows the proper way to end off the **serving**, or **lapping**. It is also used to end off any lapping done for repairs. The **timber-hitch** and **end-knot** should be learned immediately by every beginner.

New-fangled contraptions supposed to facilitate the loose should be avoided. We have seen bowstrings fitted, above and below the **nocking-point**, with "roller bearings"—hollow tube devices that are supposed to let the string "roll easily off the fingers" when the release is made. These are not necessary, are of no help, and are positively harmful to the bowstring, since the sharp bend just above and below the rigid tube tends to break the fibres.

Nothing makes for good loosing like the feel of a well-served string on the tips of the drawing-fingers.

CHAPTER XI

THE ARROW—SOME GENERAL REMARKS

The bow is the prime weapon of the archer; but the arrow is of equal importance. Without good ammunition the best gun would be worthless. Without good arrows the best bow is little better than a stick.

An arrow looks simple, but, in reality, a good arrow is as complicated as the bow itself. It is commonly said, that though anyone can make a bow, it takes an expert to make a good arrow. Anybody who tries to make equipment will soon appreciate the truth of this assertion.

Any stick of wood that will bend without breaking and that has a bit of spring to it will serve for a bow; but the production of a good arrow calls for knowledge and craftsmanship of a superior order.

If we exclude juvenile and toy equipment, arrows can be called *cheap, middle and high-priced.*

A fairly good cheap arrow for beginners will cost from fifty to seventy-five cents. They are usually made of birch.

A better arrow, of **self-pine**, will cost from seventy-five cents to a dollar.

Footed-arrows will cost from one dollar and a half to two dollars.

The *high-priced* arrows that come in **matched-sets** are the most expensive. A good set of matched arrows will bring from twenty-five to thirty-five dollars a dozen—and are hard to get at any price.

Arrows made from a single stick of wood are termed **self-arrows.**

A **footed-arrow** has a main portion of pine or other light, stiff wood, with a **footing**, or **foreshaft**, of hard dense wood, usually of another colour, glued to the front, as shown in *Figure* 24.

For beginners we recommend the old reliable **self-birch** arrows of good quality. Many birch arrows are made from inferior material and are worthless; but if made from the better grade commercial dowels they are fairly good to start with.

Birch arrows warp easily, particularly on dealers' shelves. But they can be readily straightened.

STRAIGHTENING ARROWS

To straighten a warped arrow: (1) hold it over a gas-burner or electric stove. Take care not to scorch the shaft. (2) Bend

FIG. 24. FORESHAFT OF A FOOTED-ARROW

the shaft carefully to straighten it. (3) Hold it thus for a few moments until the wood is set.

A beginner is almost certain to wreck his first dozen arrows in short order, so an initial investment in cheap ones is good practice. Later he can lend survivors of his initial set to friends.

Birch arrows are tough and will stand hard usage. Target-arrows of this material make splendid light hunting-arrows, espe-

cially for birds. If pointed with any of the regular target-piles they will rebound from branches and tree trunks, and not stick where they cannot be retrieved.

For class work and group participation in archery practice, particularly with organised athletic departments of schools and camps, good birch or other hardwood arrows will materially reduce the equipment bill. During such archery participation arrows are treated with anything but respect, frequently being yanked unmercifully from the target or ground—even stepped on. The birch shaft will often stand even this abuse without breaking.

With bows drawing from thirty to forty pounds, *good* birch arrows work very well. But they are too supple to be worked with stronger bows, and too heavy for satisfactory outdoor use with weaker ones.

For distances in excess of forty yards birch arrows are too heavy with the weaker bows, and flights fall short unless a very high point-of-aim is used. A lighter arrow will give a lower trajectory. Consequently, for this work, **self-pine** arrows are used.

The chief objection to self-pine arrows is their fragility. They are easily broken, both at the pile and at the nock.

To obtain a more durable arrow the **footed-arrow** is made. **Footed-arrows** are more expensive in first cost, but are far cheaper in the long run. A hit against a leg of the target-stand is nearly always fatal to the **self-pine** shaft; but a **footed-arrow** is seldom damaged by such direct impact.

The three principal parts of an arrow are **shaft**, **pile** and **feathers**.

TYPES OF ARROW-SHAFT

The shaft may be: (1) **cylindrical**, (2) **chested**, (3) **bob-tailed**, or (4) **barrelled**. See *Figure* 25.

The **chested-arrow** is heavy at the nock, then tapers gradually towards the pile, like a miniature billiard cue. It is often used for flight-shooting experiments where a very light shaft is desired, but with sufficient stiffness at the rear to withstand the drive of the bow without buckling, and with sufficient bulk at the back for the nock.

The **bob-tailed-arrow** is the reverse of the **chested**, and is used where bulk or weight is desired at the front end.

The **barrelled-arrow** is smaller at *both* ends and slightly larger in diameter at the middle.

Major C. H. Fisher, Champion Archer of England, 1871-74, was an enthusiastic advocate of the barrelled-arrow. As he was a very fine shot and one of the few archers who ever scored 1,000 points for the Double York Round in a public meeting, his opinion must be respected.

Personally we do not favour the barrelled shaft, as it reduces the weight of the front half of the arrow too much to assist with

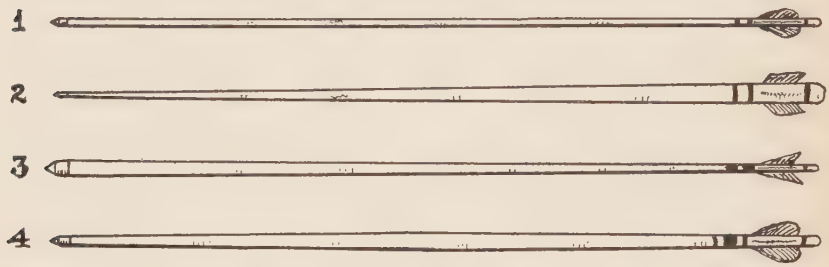


FIG. 25. 1. CYLINDRICAL ARROW. 2. "CHESTED" ARROW. 3. "BOB-TAILED" ARROW. 4. "BARRELLED" ARROW

the "archer's paradox," a phenomenon that we discuss more fully on *Page* 204.

The **cylindrical-arrow** is generally used for target use.

The unfeathered portion of an arrow is generally spoken of as the **shaft**, although the word is also used generally as a synonym for the arrow as a whole.

THE POINT, OR PILE

Cheap arrows are made with **bullet-jackets** for points. This is a good expedient when the standard type of target-pile cannot be obtained. The standard, or **parallel-pile**, as used in the United States, is turned from cold-rolled steel rods. The writer prefers a pile with about one-quarter inch of solid metal at the point with an over-all length of about one and a quarter inches. This is slightly heavier than most points, but it helps load the front of the arrow and will not crush in when a hard object is hit.

The **bullet-point** is very light, but its real objection lies in its tendency to kick the arrow decidedly to the left if the full length of shaft is drawn in aiming.

The **parallel-pile** is simply a continuation of the shaft itself that allows the arrow to begin its slide past the bow without this disturbing initial side-thrust.

The difference between the **bullet-point** and the **parallel-pile** is clearly shown in *Figure* 26.

As explained on *Page* 35, arrows are customarily made in two lengths, twenty-eight and twenty-five inches. Some archers prefer arrows made to some odd length in between and have special ar-

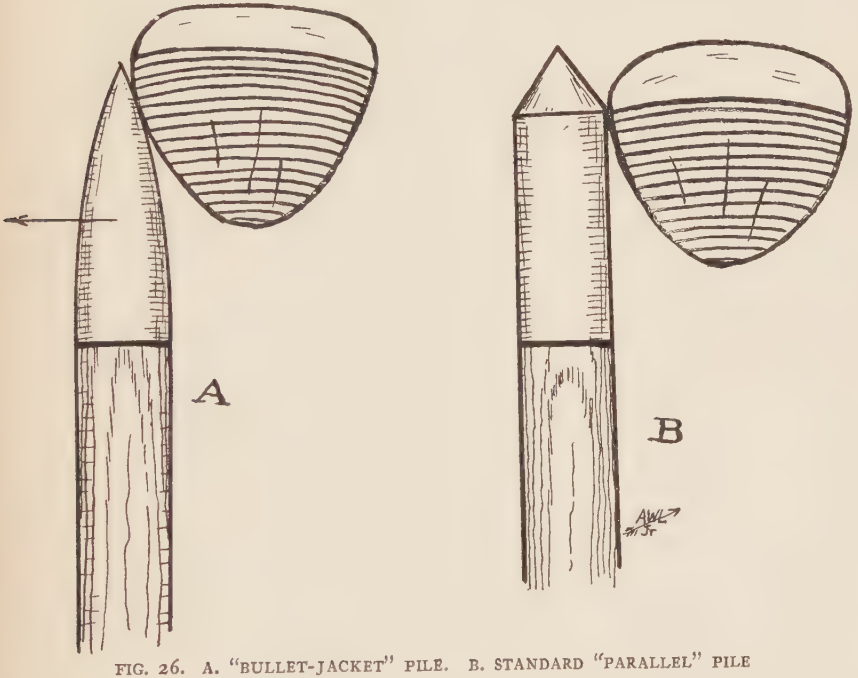


FIG. 26. A. "BULLET-JACKET" PILE. B. STANDARD "PARALLEL" PILE

rows so made, usually paying more for them. The pile itself makes a splendid drawing-gauge. If the arrow is to be fully drawn, it is by all means advisable to get special arrows of proper length, or to remove and set back the pile on arrows that are too long.

THE NOCK

A simple notch sawed to proper depth is all that is necessary for hardwood arrows; but for pine shafts additional protection is needed—otherwise the bowstring will soon split the shaft. Four

common methods of reinforcing the nock end of the shaft are shown in *Figure* 27.

In (A) the end of the shaft is sized with glue and wrapped with fine thread.

In (B) a slot is cut in the end of the shaft, before it is notched, and an insert of compressed fibre glued in place. This is a very easy and satisfactory operation.

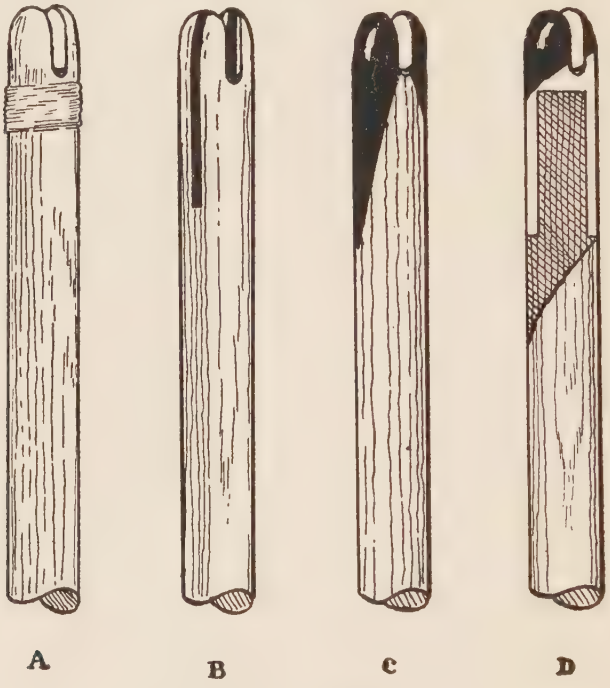


FIG. 27. NOCKS

A. Nock wrapped with fine thread
B. Sheet-fiber insert.
C. Old Fashioned "Wedge Nock."
D. Tubular Nock.

In (C) we have the time-honoured nock that old fletchers have used for many generations. A wedge-shaped insert is glued in a cut made to accept it, and the notch is made in this. This wedge was formerly made of bone or horn, but is now commonly made of fibre.

In (D) we have a special tubular-shaped nock, made either of fibre or metal—usually aluminum—that is fitted onto a tenon.

Often a bit of hollow tubing is used, which is almost as good.

The solid or tubular nocks are usually found on quantity produced arrows. But owing to the difficulty in planing through these "to make weight," the best of fletchers prefer not to use them, and favour the wedge-shaped nocks shown in (**C**).

The standard target-arrow is supposed to be 5/16 inch in diameter. Ladies' arrows are sometimes a trifle less. Men's arrows may be a trifle thicker if made from wood of light specific gravity.

WOODS FOR ARROWS

Various arrow-makers prefer variously favoured wood. One swears by Norway pine, another likes Douglas fir, long-leaf yellow pine, Port Orford cedar or some other.

As a general rule Norway pine is considered the king of arrow-woods, but it is difficult to obtain the genuine. By *Norway pine* we do not mean any northern grade of white-pine that might be so known to the lumber trade—but genuine *Norway pine* from Norway itself.

The writer has made arrows of various materials, with which he has shot innumerable American Rounds in excess of 90-600; and, in view of his personal experience, endorses:

Any wood that will enable us to make a finished shaft of proper weight, approximately 5/16 inch in diameter, and of sufficient spine to enable it to perform properly.

This does not mean that we can use any wood indiscriminately. But it does mean that by careful selection, we can procure first-class arrow-wood in individual specimens of many of the pine variety of woods.

So long as the proper shooting-qualities are finally obtained the archer need not worry as to the exact species of wood in his arrows. However, from the nature of the necessary qualities some variety of pine or allied tree is used to make the main portion of the shaft.

Every arrow-maker is continually on the lookout for good wood, and an exceptional board is treasured for special use.

The writer recently secured some exceptional thick spruce boards from the wreckage of an old house blown down in the St. Louis tornado. Some of this wood, which is over fifty years old and thor-

oughly seasoned, will undoubtedly prove superior to many individual specimens of a generally accepted better material.

In the manufacture of arrows comparative ease in shaping the various woods is an important consideration. The softer and whiter woods are easier to work round than the more resinous; but a proper amount of resin, or grain, is necessary to insure proper stiffness and resiliency. In speaking of *resin* we refer to a well-defined layer of grain—not free gum.

White-pine, sugar-pine, pondosa and other soft varieties lacking in this well-defined grain lamination are likely to prove too pithy for arrows that are to be used with strong fast bows.

Within the past year the writer has used *Port Orford cedar* exclusively. This is an ideal arrow-wood if handled properly. Unless care be taken, however, arrows of this wood are exceedingly stiff and disagreeable to shoot.

SPINE IN ARROWS

Regardless of material, the all important quality in an arrow is spine. All else is secondary. This quality is a combination of *stiffness* with *resiliency*. It is not mere stiffness, but an elusive quality that can be understood more easily than defined.

The shaft must be stiff enough to withstand the shock of the initial thrust from the bowstring. It must be supple enough to bend as it passes the bow. And it must have resiliency, to return to the straight condition as soon as it clears the side of the bow.

An arrow that is too weak or supple will flirt or gad to the left, often so far as to be dangerous to shoot.

An arrow that is too stiff will also shoot decidedly to the left and will jar the bow-hand considerably.

Strange to say, an arrow that is only "moderately too stiff" will often shoot slightly to the *right*.

By altering the flexibility of the shaftment, or that part of the arrow that lies within the bow when it is put on the string but not drawn back, slight variations in flight can be changed. An arrow that shoots high may be made to shoot low, and an arrow that shoots to the left can be made to shoot to the right. The writer definitely proved this fact several months ago, but has not yet had time to determine the limits of such alteration.

Also, an arrow put on the string with the cock-feather *in* will

nearly always shoot differently from the way it shoots if put on the string in the correct position.

A good arrow will shoot precisely in the direction in which it is aimed, not off to one side, as would be supposed. It was the realisation of this fact that prompted the late Horace Ford to draw so that the entire shaft lay in a plane beneath his aiming-eye—instead of to the ear, as had previously been the time-honoured method.

The ideal arrow is, among other things, perfectly round in cross-section, cylindrical in shape, and perfectly straight from pile to nock!!! A close examination of almost any specimen, though, will reveal plenty of divergence from these *ideal* conditions.

The archer who "knows his arrows" knows that the best arrows are made by hand, with a plane, from wood that has been carefully selected and reduced to size. Consequently they are apt to be slightly out-of-round and possibly not altogether perfect in cylindrical perfection.

The expert arrow-maker first selects his material and makes his shafts from these. In bringing a set of twelve arrows to weight it may be necessary to reduce one more than another, so that a caliper can easily detect a slight difference between shafts, and often between middle and end dimensions of an individual one.

Machine-made arrows that are made to look pretty and sell because of their exquisite perfection in external appearance are beautiful examples of fine workmanship; but even in these *perfect straightness* is a rarity.

A comparatively long and slender stick of resinous wood when worked into arrow dimensions has strains of various degrees uncovered as the work progresses. These tend to deform the shaft more or less. The longer and better the seasoning, the less apt is such warping to appear. But it is seldom that a perfectly straight shaft in-the-rough remains straight when the arrow is finished.

A single wide bend from end to end, which results from one side being weaker than the other, is a serious defect; but a series of slight corkscrew bends that can be observed by sighting critically down the arrow with one eye shut—is almost to be expected.

An arrow should be *practically* straight, rather than expected to be *perfectly* straight.

The real test of an arrow for "straightness" is made by balanc-

ing the shaft between the nails of the thumb and second finger as those two members are held touching together. It is then spun sharply with the other hand, like a small top is spun. If the arrow continues to spin in this position it is a good one from the standpoint of straightness. If it be warped or curved too much it will immediately hop off the finger-nail support.

FLETCHING GLUES

We are frequently asked what glue to use in making arrows.

Personally we prefer to use good cabinet-makers' glue for nearly all archery construction. This glue must be soaked over night and used while hot.

Many tackle-makers use waterproof glue for uniting the various parts of arrows.

For hunting-arrows, where one may find himself out in continued rain or wet weather—when damage to tackle from continued exposure to moisture would be serious, the use of waterproof adhesive is unquestionably right; but for target equipment we personally avoid the use of insoluble casein glues.

Target-arrows are shot again and again, and during their comparatively long active life are subjected to much abuse. Feathers need more or less replacement and a damaged nock or splintered footing can often be easily repaired if the fractured member can be removed. Parts put together with animal glue can be easily steamed apart with little damage to the rest of the assembly, whereas repairs to shafts put together with insoluble glue would be out of the question.

As target-shooting is seldom indulged in during rain or showers, and since a slight wetting does not hurt the equipment if it is wiped dry within a reasonable time, the question of exposure is not a serious one.

At the three last National Tournaments it was necessary to shoot at least one day in heavy rain. At Bryn Mawr in 1926, and at Soldiers' Field in 1927, we shot in rain; and at the Westchester-Biltmore at Rye in 1928 it rained very heavily during the second York Round. Yet in this rain the writer made the high score mentioned on *Page* 74. He used his ordinary arrows, joined and fletched entirely with ordinary good quality animal glue. He did take the precaution, however, to put a drop of machine oil on

each feather and wiped off each shaft with an oiled rag after they were drawn from the target following each end.

To-day, however, good arrows are more easily obtained; so for archers who prefer to buy new arrows to replace damaged ones shafts joined with casein glue may be desirable.

For fletching arrows the use of modern celluloidal cements is becoming popular. Du Pont's Household Cement is at present the leading adhesive for this purpose. It is not so satisfactory for the expert fletcher, but for the amateur who places his vanes in position with pins or clamps and can afford to wait several hours for them to set, this is an excellent cement to use. Stripped vanes can be pinned in place on wooden shafts. On such arrows this cement, which is waterproof, is easily applied, handy and thoroughly practicable.

A decided advantage is obtained by the use of celluloidal fletching cements in turning out good-looking arrows for quantity production. Instead of the painstaking process of painting between the vanes, the entire shaftment can be lacquered by dipping it in the desired colour—and the vanes cemented on after this has been done.

When animal glue is used, however, the vanes must be affixed to the bare wood, and any painting done thereafter.

Celluloidal cement is also used for fletching metal arrows, as will be explained later, in *Chapter XIV*.

REPAIRING DAMAGED VANES

Every archer should learn to replace torn or damaged vanes. In spite of precautions and care feathers are easily damaged. Extra vanes, prepared and cut to shape, should be carried in the kit. This makes it possible to refeather a damaged shaft overnight.

Whenever an arrow is broken care should be taken to recover the broken pieces. These can usually be glued together to make the shaft practically as good as new.

Extra points or piles should be at hand to replace those inadvertently "left in the target." These should be affixed with arrow-head cement, a gum ferrule-cement that is applied with heat.

CHAPTER XII

THE FEATHERING OF ARROWS

To guide the shaft so it will fly straight after it leaves the bow, feathers are affixed to the rear end of an arrow.

The feather as it is used on the shaft is technically termed a *vane*.

Three vanes are used.

Formerly long, large vanes were the custom; but these have long since been discarded for the shorter vanes in universal use to-day.

The feathering or fletching of an arrow is a difficult process for the beginner, but very simple after the knack is learned. It must be done with care. The vanes are simply glued in place. No

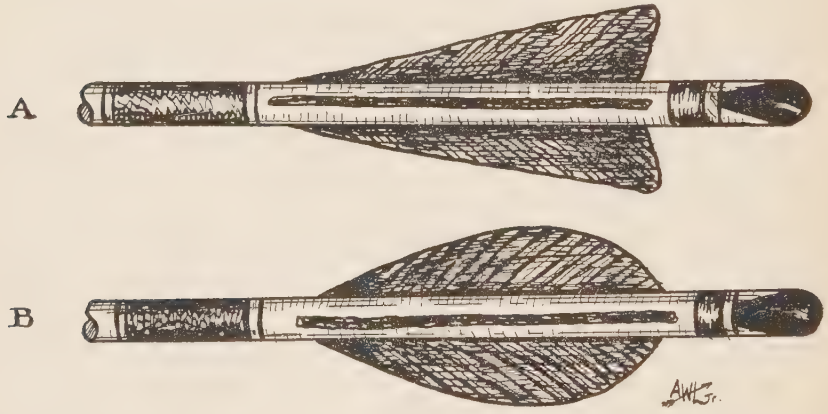


FIG. 28. A. TRIANGULAR VANES. B. "BALLOON" OR PARABOLIC VANES

binding whatever is necessary, neither are grooves first cut in the shaft to hold them.

One vane—known as the *cock-feather*—must be put on at a right-angle to the nock. It is usually of a different colour from the other two. In shooting, an arrow is nocked with the cock-feather out. The other two vanes then slide by the side of the bow without being damaged.

The usual type of vane now used is the *balloon* or *parabolic*. *Triangular* feathers are sometimes seen, but are rare. The balloon pattern is stiffer and more durable. *Figure* 28 shows the two types. The vanes should be about two and one-quarter inches long and about three-eighths of an inch high. They are placed as far back on the shaft as practicable, to give steerage. However, enough room must be left to give the drawing-fingers plenty of space to function without damaging the rear of the vanes.

A stiff durable feather must be used. The "grey goose" feather, widely praised by poets and other writers of historical poetry and prose, is now considered an inferior material. The wing feathers of the peacock are highly prized. Feathers from the eagle's wing are probably unsurpassed. Buzzards, condors and other large birds yield satisfactory vanes. But such material is so difficult to procure as to be practically out of the question except as a curiosity.

For all-around durability and availability the pointer-feathers of the domestic turkey are almost universally used by modern fletchers. The white feathers are used by many because of their "beauty." They can be dyed to brilliant colours. But for efficiency, the tough dark feathers are by all means the best.

STRIPPED- AND CUT-VANES

For the better grades of arrows the vane is prepared for affixing to the shaft by paring the quill, to leave a stiff rib-like foundation for the vane itself. These **cut-vanes** are more durable and can be affixed in a more nearly perpendicular and straight position than the so-called **stripped-vane**. With the latter the barbed, or "feathery," part of the feather is simply peeled from the quill and the excess width of quill cut off with scissors.

Stripped-vanes usually project from the shaft at a slight angle. If all three lean over to the same degree no harm results.

Cutting vanes is a difficult task, requiring a razor-edged knife and considerable skill; and as **cut-vanes** are harder to affix with the ordinary adhesives the amateur usually confines his fletching to stripped feathers. On account of the rapidity with which stripped-vanes can be prepared they are almost always found on the cheaper arrows.

To prevent moisture from affecting the glue—except when ad-

hesives like the waterproof celluloidal kind are used, as explained on *Page* 105, the **shaftment**, or rear portion of the arrow, is carefully painted and varnished. Care must be taken to see that the ribs of the vanes are well covered. This protective painting is elaborated to serve as a decoration of heraldic nature, termed the **crest**. Every archer adopts his own colours with combinations of coloured rings to suit his fancy. This crest also serves to identify his arrows, and renders scoring easy. Several archers may shoot at the same end into the same target and each easily identify his own shafts—because of the different crestings.

NECESSITY FOR FEATHERS

We will now explain the action of the feathers and endeavour to correct certain popular misconceptions in regard to feathering.

The feathers are necessary; but they are of comparatively little special importance so long as certain definite considerations are taken care of.

The laws of physics are more important to accuracy than any ideas of colour harmony or special considerations of craftsmanship—as to symmetry, patterns, or other matters pertaining to looks or beauty.

We hold no brief for the unworkmanlike bowyer or fletcher. A true craftsman in this line is a real artist who takes pride in the beauty of his creations. Exquisitely beautiful arrows are a pride, too, to the possessor. But, from a cold-blooded standpoint of shooting-efficiency, a bad-looking arrow may be far superior in shooting-qualities to a gem of the cabinet-maker's art that is otherwise lacking in mechanical correctness.

The chief care in feathering an arrow is to see that no single vane tends to rotate the shaft in a different direction from the other two.

SPIRAL AND STRAIGHT-FEATHERED ARROWS

There are two distinct methods of feathering arrows, **spiral** and **straight**. In the **spiral-feathering** the vanes are affixed like the blades of a ship's propeller, only to a lesser degree. This "rifling" is done intentionally to impart a distinct rotational effect to the flying shaft. In a **straight-feathered** arrow the vanes are affixed practically parallel to the axis of the shaft.

We formerly advocated a moderate twist, but with a better understanding of the subject reversed our opinions, so that at present we believe that the ideal arrow should not rotate at all. This ideal state, however, is not possible under practicable conditions, so a very slight rotational effect in one definite direction should be aimed at—merely to insure that all three vanes act alike.

The pointer-feathers from the turkey's wing are slightly curved, like the wing-camber of an aeroplane. It is impossible to get all vanes on in a perfectly straight line and keep the surfaces of all vanes true.

All three vanes must come from the same side of the bird, and the three vanes on a single arrow should come from the same portion of three different feathers, to insure that all have the same pitch and texture.

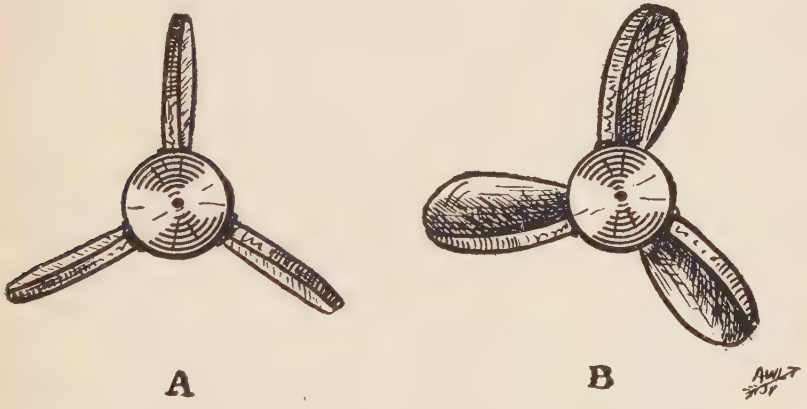


FIG. 29. A. SLIGHTLY-SPIRALLED ARROW. B. HEAVILY-SPIRALLED ARROW

An arrow on which one vane is from a different wing, or on which one vane is reversed slightly from the other two in trying to put it on too straight, will try to rotate in two directions. It will wobble and stagger like a drunken sailor.

Figure 29 shows at (A) a **slightly-spiralled arrow**, looking from the pile. Sketch (B) shows a **heavily-spiralled arrow**. A **straight-feathered arrow** would merely show the edge of the vane. Our personal choice is between the perfectly straight and the slightly-spiralled type here pictured.

Spirally-feathered shafts *appear* to fly straighter and are therefore preferred by many beginners. They are also furnished to

novices by canny arrow-makers—because they are seldom criticised on account of wobbling. But this apparent trueness of flight is a deception. If sufficient spin is imparted to it almost any shaft will *fly* straight, even from a jerky, clumsy or careless loose!

Arrows when shot react both to the forces of the bow and to the inherent strains active in the shaft itself. It is only after the arrow has cleared the bow and straightened itself in flight that any guiding force can be exerted by the feathers. If the arrow begins an early and violent spin soon after it is free it is brought to a steady-flying condition within a few yards. This comparatively short distance we term the distance-of-jump. The remainder of the flight is traversed in a beautiful, true-flying parabolic path. But the damage to the aim is all done in the first few feet—which is traversed so quickly that few archers perceive what has actually happened.

The straight-feathered arrow depends on a rudder-like action in two dimensions, rather than on a spin, for its directing. Contrary to popular notions, the feathers *guide the shaft by steerage*—not by adding drag or resistance, after the action of a sea-anchor.

The arrow sails through the air like an aeroplane.

So long as the arrow flies straight—the vanes exert practically no force—only the resistance of their edges, which is insignificant. But if the tail moves to one side, or up or down, air pressure on at least two vanes forces it to fly straight again. This action is like the two sets of rudders on a submarine or torpedo.

Three vanes are the minimum number necessary for proper steerage. Four vanes are theoretically better, and would be desirable if the arrow had no spin. But, practically, four vanes offer no advantage over three. The arrows being used by the writer when the snap-shot shown in the upper right-hand corner of *Plate* I was taken were fletched with four triangular vanes. No better results could be detected and these shafts were later changed to three-feathered ones of the usual type.

Two vanes, one on each side of the shaft, will not guide a straight-feathered arrow, since they only act in a single plane. Such an arrow would fly like an aeroplane with either rudder or elevator removed.

Since the straight-feathered arrow depends on its vanes to *continue* its flight in the true line-of-flight direction by a rudder-like action, the arrow must be sent from the bow in a smooth, straight,

careful manner, to insure a pretty flight. With a poorly loosed shaft the corrective forces of the vanes are not fully operative until the shaft is a considerable distance down the course. The tail will therefore wobble—since the influence of the resisting vanes imparts a pendulum-like motion to the tail of the arrow.

The straight-feathered arrow must be carefully loosed or the arrow will wobble more or less of its entire way to the target.

This wobbling is not so grievous a fault as it might seem, since a well-aimed shaft will often wobble itself, time after time, into the target, often into the very Gold itself.

But we must not confuse the *staggering* of a poorly-feathered shaft with the legitimate *wobble* of a well-made straight-feathered one!

GOOD LOOSING AN IMPORTANT FACTOR

Although it is the score that counts, every archer likes to send his shafts down the course in low-flying, true flights. This desire involuntarily urges him to remedy wobbly flights by releasing smoothly. A spirally-feathered arrow hides a bad loose, but the straight-feathered arrow quickly exposes it. The writer believes that it is this indirect influence rather than any great direct difference between actual flying-qualities that accounts for any advantages obtained from using what is really a more difficultly controlled arrow.

The best archers are naturally those who have the best loose, since the loose is the great problem that remains after the other acts in manipulating the bow-and-arrow become involuntary.

The advantages of good loosing apply to different sizes and shapes of feathers also. Any one can get well-flying shots with arrows having large wind-dragging vanes "tied" on behind. But such vanes cause slower flights, necessitating much higher points-of-aim. Experienced archers have learned that skill in loosing enables them to use comparatively small feathers, to reduce wind resistance to a minimum and, they accordingly, get much flatter trajectories.

From distances up to and including fifty yards the technical considerations just discussed in regard to feathering are not so important, but at longer distances the speed of an arrow rapidly diminishes as it nears the target; and any advantage from faster

flights and lower points-of-aim become exceedingly important. At 100 yards every possible advantage in fast flight, low point-of-aim and minimum side-drift due to wind is important. If one watches good archers shooting from this distance he will at once perceive the difference between fast and lazy shafts. An archer who is struggling to make the distance will exhibit considerable effort in launching his poorly-directed shots; but the expert who is consistently plugging the target to the joyful song of hitting thuds, at this extreme distance of the York Round, seemingly exerts little effort. His arrows, instead of struggling laboriously on their way, appear to leap from the bow and speed away like thoroughbreds.

CHAPTER XIII

MORE ABOUT ARROWS

The subject of arrows alone would fill a large volume. Though apparently simple in appearance the technical considerations and qualities of arrows promote endless discussions amongst archers.

The only arrow generally used by the abler archer is the **footed-arrow**. So, unless specifically stated otherwise, our discussion in this chapter relates particularly to it.

Footed-arrows are used because they are more economical in the long run than **self-pine arrows**, and fly steadier. The heavier hardwood foreshaft weights the front slightly and puts the balancing-point slightly ahead of the middle of the arrow. It also stiffens the first eight inches or so, which prevents the arrow from buckling to a certain degree just after the instant of loosing.

REINFORCED AND LOADED POINTS

Self-arrows are sometimes made with steel reinforcing-rods, two or three inches long, inserted in the front end. This protects the weak front-portion, just behind the pile, but not to the same extent as a hardwood footing. The writer used this type of arrow at his first National Tournament in 1925, at Rome, N. Y.

Arrows are often **loaded** by reinforcing the front with a heavier rod or wire-nail, to bring the balancing-point forward and "make the arrow shoot straighter."

We have found this bad practice. Too much loading at the front causes the arrow to buckle slightly if shot from a fast bow.

It is wrong to load the front of an arrow too much, for another equally important reason. If the centre-of-gravity is too far forward an arrow in flight tends to turn like a weather-vane, and points decidedly up-wind in a side breeze.

Several months ago we so loaded six fine target-arrows by inserting a fifty-grain length of finishing-nail in a hole bored in the end of each footing, after first removing the pile. On testing these

we found that the arrows were not so good as they were before.

Arrows with heavily-loaded ends may shoot very well from weak bows at short distances; but for use in a fast bow, with an efficient drive, excess loading is detrimental.

FOOTINGS

The standard material for footing arrows is **beefwood**. This is a heavy, reddish wood that resembles dried beef in appearance. It is tough, hard and works well under a sharp plane. Being of a contrasting colour from the light pine shaft, it helps produce a beautiful arrow.

The writer, however, is partial to lemonwood for footings, since it is easy to obtain, is of suitable density, and also works easily under the plane in conjunction with the main part of the shaft. We use a rather deep footing, with about two and one-half inches of solid lemonwood behind the pile before the split of the joint begins. This puts the balancing-point of the arrow about eleven and one-half inches behind the point in a twenty-eight-inch shaft.

Our shaftment is decidedly tapered, being planed down until the last five or six inches is flexible to the proper degree. Because of this planing we use the traditional wedge-shaped nock of horn or hard fibre. On *Page* 207, under our discussion of the **Archer's Paradox** we give our reasons for so treating the shaftment of an arrow.

Fastidious archers in the past have insisted on arrows with extremely fine and close grain; and arrow-makers were forced to supply fussy and often cranky enthusiasts with what was considered *au fait*. Such fine-grained shafts are not necessary. In fact we believe that the best arrows are to be made from wood having a clearly-defined grain, neither too fine nor too broad in resin. We have made our best scores with shafts of a decidedly coarse character.

ARROW-WEIGHTS

Arrow-weights have usually been expressed in **shillings**. This practice is a relic of old English makers, who graded their shafts by balancing them against silver coins of the realm. If we so

graded arrows in the United States a "three-quarter arrow" would exactly balance three new twenty-five-cent pieces.

At present we are departing from this old custom, and favour expressing arrow-weights in grains. The following table gives a comparison of the usual arrow-weights. Fractions of shillings are expressed in pence:

Shilling Weight	*Grains*
3d	21 2/3
6d	43 1/3
1/	86 2/3
3/	260
3/3	281 2/3
3/6	303 1/3
3/9	325
4/	346 2/3
4/3	368 1/3
4/6	390
4/9	411 2/3
5/	433 1/3
1 Ounce	437 1/2

MATCHED ARROWS

It is customary to purchase arrows in matched-sets. Fine tournament arrows weigh within five-grain limits of each other.

The best arrows are made in sets and the shafts are brought to correct weight before fletching and finishing. Completed hand-made arrows, therefore, usually weigh a few more grains than they are marked.

When arrows are made in large numbers they can be sorted out according to weight after they have been finished.

Matched-sets cost more than like-appearing individual arrows not matched; but their superior performance is well worth any difference in price.

Identity of weight and construction, however, does not guarantee identity of performance. Arrows may be precisely alike as to specifications, dimensions and finish, and may even be made from sticks sawed from the same board; but that is no assurance that they will perform alike.

The most expensive arrows are grouped in sets according to

performance. This must be done by an expert archer. Such sets are exceedingly difficult to obtain. It is said that at present there are fewer than ten archers in the country who are capable of passing judgment on the quality of arrows.

MACHINE-TESTED ARROWS

Mechanically-shot arrows are beginning to appear on the market with the present increasing demand for good tackle. To obtain these, large numbers of arrows are shot from "mechanical-archers" and those that pattern in restricted areas are grouped and sold as "machine-tested" or "flight-tested" arrows.

The best "mechanical-archer" we have yet seen is that developed by Mr. Clarence N. Hickman, whom we previously mentioned on *Page* 14. Mr. Hickman and this machine are shown in photographs on *Plate* III. His is an articulated device, far superior to the ordinary solid rest. The "bow-arm" is free to move from side to side, and a wrist movement simulates that of the human member.

The reliability of machine-testing for arrows is a moot question. The group or pattern made by such a device with a given set of arrows will not necessarily duplicate or forecast the grouping that will be made by an archer; but it appears that an arrow that performs consistently for the machine will fly consistently for the human archer. At any rate, from a commercial standpoint, "machine-tested" arrows should prove much better than arrows that are merely matched in weight.

It may also be noted that, as no two archers handle their bows exactly alike, the group made by one archer with a set of arrows will not necessarily duplicate the group made by another archer with the same shafts.

Archery is seemingly a sport that refuses to obey mechanical processes, and in this we have a plausible explanation for its remarkable fascinations.

Exact similarity in weight is no proof that arrows will fly alike. A difference of from ten to twenty grains in the heavier men's arrows, in itself, is of little consequence. But since close-matching in this regard is a good quality, rather than bad, all arrows should be purchased to weigh the same.

It is also good policy in making arrows to see that the balancing-

point is at the same place in all. But, as with the quality of exact weight, this also is a refinement that can be carried to extremes.

We personally prefer arrows that balance an inch or two ahead of the exact middle—not too far forward, for reasons mentioned on *Page* 113 in reference to loaded arrows.

FREAK ARROWS

Freak arrows for which great claims are made are periodically invented. But their chief virtues lie in their stimulating effect on the imaginations of inventors and advertising writers.

We see "streamline shafts" for which wonderful claims are expounded. According to the inventors, "such arrows fly faster, offer less wind-resistance, etc. . . ." But we believe these claims are rather far-fetched.

Unlike the rifle-bullet, arrow velocities are comparatively low. The arrow itself is essentially an inefficient projectile, and any minute advantage gained from streamline design would exert a totally insignificant effect. Besides, any advantage in lessened resistance would be immediately lost when we affix feathers, which puts on added resistance.

Arrows are sometimes made with pins at the back instead of nocks. These fit into a receptacle on the bowstring at the nocking-point. Such devices are utterly worthless.

Good archers can occasionally make fair scores with odd and freakish equipment; but this is done, we believe, *in spite of,* rather than *because of,* such contrivances.

We repeat, there is no substitute in archery for ability. Practice and a thorough knowledge of fundamentals can alone produce results.

Here and there an unknown archer happens to make a creditable score; but the one to pattern after is the consistent performer—one who year in and year out makes record performances. And if we watch the high scores we shall see that the best work of the greatest archers is done almost exclusively with time-honoured material and implements.

CHAPTER XIV

ARROWS AND ARCHERS—METAL ARROWS

A widely prevalent impression exists in the sport of archery, as in others, that proficiency *can be bought!*

The great middle-class of performers—those progressed beyond the raw-beginner stage, but not yet arrived in the expert class—are too prone to blame their arrows for poor shooting, when the fault lies with themselves.

They continually seek higher scores by buying all the high-priced arrows and fancy gadgets they can obtain.

If any improvement does result, it is apt to be largely due to luck.

However, cheap, ill-made and poorly-matched arrows are like tools of respective qualities—all right for the beginner and casual user, but otherwise useless. First-class results can only be secured with the best of equipment. The very best arrows have limitations; but the archer usually has more.

A good archer can make high scores with *any* arrows of reasonably good quality. A poor archer cannot make good scores—no matter what he uses!

One of the most interesting phases in the practice of archery lies in the distinction and ability to recognise the difference between faults chargeable to the arrow and those to be credited to the shooter himself.

An archer, to succeed, must learn to diagnose true causes of misses and inaccuracy, and be able to correct the faults that are the basic causes of error.

Good arrows are a tremendous factor in making high scores; but even so, each arrow has its own peculiarities—and unless these are taken into account with each and every shot, no archer will progress very far into the expert class.

If a capable archer, say one rated as a consistent 550-point shooter at the American Round, can take a dozen arrows and secure hits consistently in the black or better with each one—using the same point-of-aim for all—from sixty yards, he has an excellent

set of arrows. No better *group* for a new set of arrows should be expected.

An ambitious archer in the expert class—say one who can *consistently* exceed 600 points for the American Round—who wishes to try for record-breaking scores, may cull over several dozen shafts and finally obtain six that have practically identical flights.

But this is a dream rather than a reality, even so.

The writer has made hundreds of arrows and has made some creditable scores. But he has never yet had six *good arrows* in his possession at any one time! There has always been at least one *prima donna* that cavorted in a manner peculiarly its own, and spoiled a really good score.

Furthermore, arrows that group well at one range may fly totally different at others.

We learned the truth of this from personal endeavours to seek some reliable way of sorting so-called *tested-arrows* into groups.

On one occasion we took a number of arrows and shot them repeatedly from 100 yards, selecting six of these that made repeated hits within the area of the blue. But at forty yards two arrows flew entirely out of the target. Also, on a similar occasion, one arrow that flew low from 100 yards with respect to the centre of the group—flew over the target at forty yards.

Such phenomena are due to two factors, jump and drag. An arrow that has a more decided upward jump as it leaves the bow may fly high at short ranges; but if the same arrow has a greater air resistance or feather-drag this initial jump will be more than compensated for at the longer ranges, and the same arrow then hits low.

Thus, the archer who wishes *perfect arrows* must really have a different set for *every range*.

It is this additional complication in the fascinating and elusive sport of archery that further discounts the placing of too much reliance on the performance of so-called tested-arrows.

The subject of grouping and correction thereof for arrows will be treated in greater detail in *Chapter XXXII*.

GOOD SHOOTING WITH APPARENTLY POOR ARROWS

A few days before writing the original draft of these lines the writer shot a Double Team Round—on two successive afternoons.

The resulting scores were 96-608 and 96-620—192 consecutive hits for a grand total of 1,228. The shooting was all done from the sixty-yard mark.

A colour or ring analysis of this score gives:

40 Golds,
79 Reds,
50 Blues,
21 Blacks,
2 Whites,
No Misses.

The average hit value was 6.4 points, equivalent to placing all arrows within about a twenty-inch circle.

This was done with five-shilling arrows and a self-yew bow drawing about forty-six pounds.

The following Sunday he shot eight consecutive ends from 100 yards that totalled over twenty points each, two being in excess of thirty points. For the latter shooting the same arrows were used, but a different bow—the latter a lighter self-yew drawing but forty-two pounds.

We quote these scores only to study the lessons they embody; as we believe the reader will profit most from conclusions drawn from actual results.

For these scores eight arrows in all were used. Two were broken at different stages. The six survivors were in practically the same condition throughout, since the target held all hits and there were no misses to damage shafts on hard objects behind the targets.

The two arrows put aside were damaged, one being hit with another arrow, the other going through the target to hit the target-stand a glancing blow.

The shafts were of long-leaf yellow pine, footed with deep lemonwood, and pointed with heavy steel parallel-piles. The nocks were wedge-shaped of hard fibre. The feathers were of the usual balloon pattern.

Instead of being *selected specimens,* these arrows were in reality culls that had disgraced the production of several sets made for sale. Two shafts had decided corkscrews if critically examined. One had the pile awry. None were true cylinders—three being decidedly flat in spots, due to the difficulty in planing out perfectly

round shafts of this kind of wood. And three shafts were badly gouged up the side, due to slivers that were taken off in roughing out the original sticks, which could not be entirely obliterated during the later sanding and smoothing down.

The gross-weights of these arrows ranged from 424 to 455 grains.

All eight shafts had been refeathered several times, and one had been repaired from a break near the middle of the shaft.

At the time of shooting these rounds two of the arrows had only two vanes each in fair condition with the front third of the third vane torn off.

In short, so far as *appearance* was concerned they were about the most disgraceful looking bunch of "cripples" that an archer who should have been better provided with could produce. It was at the tail-end of the season, however, and we were shooting with what we had left and in the condition in which we found them at the time.

One arrow was a true *prima donna*. It flew completely off the target if aimed anything like the others. It was the antics of this particular shaft that produced the two *whites* and a majority of the blacks.

As a further complication, the last thirty arrows of the 96-620 Team Round were shot with a weakened and underdrawn bow.

Our bow suddenly developed a long splinter, running from the handle about eight inches up the top limb. We stopped shooting long enough to produce some material from the tackle-box and wrap the fracture as best we could. But the bow had weakened perceptibly, and we dared not thereafter draw our arrows to the head. The mental hazard and the break in a good streak of shooting cost us, we believe, from forty to fifty points in the last thirty arrows—spoiling what would have been nearly a record score.

The moral of this tale lies in the fact that, though the looks were anything but favourable, the two main considerations in arrow-making were rigidly taken into account—at least in five of the shafts. The feathers and remnants of feathers were all put on correctly in the beginning, and the shafts possessed to a remarkably close degree that all-important qualification of good arrows—spine!

Neither were these arrows particularly good groupers. Slight individual allowances were made as each was shot.

Efficiency in archery tackle is largely a matter of balance. Strong bows shoot faster, but are fatiguing to use. Light arrows fly sharper, but heavier shafts, particularly in wind, give steadier and more reliable flights. Arrows should be selected to perform in harmony with the bow for which they are intended. Choice enters into many particulars, as no two archers shoot exactly alike, and a detail that applies favourably to one individual may not satisfy conditions with another.

Women should use arrows weighing approximately from 300 to 400 grains. Men's arrows should run from about 370 to 435.

METAL ARROWS

Metal arrows have captivated the imaginations of tackle-makers just as have metal bows.

Aluminum and its alloys constitute the usual novelty in this line. Such shafts can be produced to weigh precisely alike, are perfectly round, and have requisite stiffness; but the *action* that characterises the well-made wooden arrow is lacking. Metal bows and arrows bear a similar relation to good wood tackle, as split bamboo fly-rods do to steel ones. They shoot, so far as mere shooting is concerned; but the *feel* is not so pleasant.

Arrows made of duraluminum shoot fairly well and are liked by some archers. Personally, though, we think them very hard to shoot as now constructed. They have a decided tendency to shoot to the left and cause a disagreeable kick to the bow-hand.

This side-shooting and kicking tendency may be overcome to some extent by filling the front end of the tube with a few inches of "foreshaft," both to weight and stiffen the front portion of the arrow. The shaftment, or rear portion, may likewise be made of wood.

Duraluminum, and more especially arrows made of pure aluminum, have a tendency to take a bend. This makes it necessary to straighten them from time to time. Such arrows are also particularly liable to damage. A glancing blow against the target-stand usually dents and renders the shaft unfit for further use.

Arrows made from commercial grades of steel tubing have also proved disappointing.

Within the past year, however, a remarkably successful metal arrow has been put on the market by the Dayton Steel Tennis

Racquet Company of Dayton, Ohio. This arrow is made from one piece of seamless nickel-steel tubing drawn very thin. The tube is plated with the new cadmium finish and is practically rust-proof.

The shaft is fitted with a solid steel pile and an aluminum nock.

Three grooves for fletching are pressed into the shaftment in proper location. These serve to line up the vanes and to depress the quill slightly for protection.

The shaftment is dipped in a solution of celluloid which forms a base to which the vanes can be securely cemented with celluloidal cement.

These arrows are grouped in sets as the result of shooting-machine tests and sold as "Flight-Test" arrows.

A dozen of these arrows were recently shipped the writer and he was agreeably surprised with their shooting qualities. The arrows tested weighed 392 grains. They had a slightly lower point-of-aim than wood arrows of about the same weight. The group or pattern was no better than that obtained with selected arrows in his possession; but it was better than is made by the usual commercial sets that are matched only in weight.

The same divergence in flight was noted as with wooden arrows in regards to distance. Five arrows of the twelve made consistent hits at 100 yards, the others being equally divided into low and high. At sixty yards or less, however, all made easy hits on the target.

The flights, however, appeared reliable; that is, groups could be greatly improved by allowing for slight variations in individual arrows. This, in fact, is all that can be expected of any arrows.

There was a slight tendency to shoot to the left, but not to a disagreeable extent. In fact, the action of the arrow as it crossed the bow was very smooth.

The principal objection we found was the extreme fragility at the point. If any hard object was hit, or the arrow pierced the target and hit the leg of the target-stand the point was easily broken off or driven in. Three of the twelve arrows tested suffered this fate during the single afternoon they were being tested. This, however, is a defect that will, no doubt, be remedied soon.

We are giving only our own personal opinions in regard to these metal arrows, from what we believe is an unbiased attitude; for we would not hesitate to adopt them if we thought it possible to make

higher scores with them. Others may entertain different opinions of their merit.

Metal arrows will not enable a poor archer to make high scores. But good metal arrows will enable the same archer to make better scores than he can make with poor wooden ones, and *vice versa.*

With a set of steel arrows similar to those just tested and herein commented on, at the 1928 National Tournament, Mr. C. J. Speidel, of Rochester, N. Y., a comparative newcomer, made an 89-611 score for the highest Single American Round shot at the tournament.

A decided advantage in favour of metal arrows is their freedom from moisture absorption and effects due to changes in temperature.

CHAPTER XV

THE SHOOTING-GLOVE AND FINGER-TIPS

A **shooting-glove**, or suitable **finger-tips**, is an article of first importance.

The bowstring is drawn with the first three fingers of the right-hand, and these must be protected. A tough-fingered individual might think such additional protection superfluous; but sooner or later he will adopt better means than that furnished only by nature.

An old glove will prove ample protection for archers using weak bows; but if stronger bows, say thirty-five pounds or more, are used, or the shooting-period extended over several hours, proper finger-tips or gloves with tabs of leather sewed onto the fingers will afford comfort.

FIG. 30. THE SHOOTING-GLOVE

Men who use bows drawing in excess of forty-five pounds will find even the thickest ordinary glove inadequate. Tabs of hard, pliable leather must be sewed to the protecting surfaces. A sketch of the common shooting-glove is shown in *Figure* 30. Bits of

leather from an old razor-strop are used by many archers for the little tabs. The front of the tabs should be left free. The thumb and little finger may be omitted or cut from the glove if desired.

Though a properly-made shooting-glove serves the purpose as well as anything, a glove is hot and disagreeable in warm weather. The more convenient and less objectionable **finger-tips** are therefore used. These are similar to stalls made to protect cut fingers from additional injury.

A well-fitting, good-feeling set of finger-tips should be considered a prized possession and carefully guarded. Their importance cannot be overestimated. Though comparatively simple in appearance and construction a good set is very hard to obtain. We have never been able to purchase a satisfactory set, consequently believe it advisable that every archer who desires a good set should make his own.

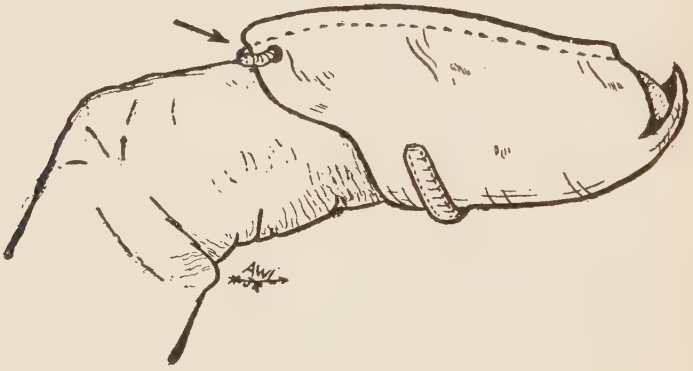


FIG. 31. "PARROT-BEAK" FINGER-TIP

Fairly good shooting-gloves can be purchased now, also sets of finger-stalls that are fastened to skeleton gloves. These, as a rule, are not as good as can be made by the archer himself. The **loose** is the most important act of the shooter, and a good loose is impossible unless the string is under absolute control at all times. And this perfection of control is impossible without finger protection that is just right!

MAKING FINGER-TIPS

To make finger-tips, procure some bits of suitable leather and a needle and thread. The leather should be soaked in lukewarm

water till soft. It can then be moulded about the finger and sewed in front up the back. Take care to leave a point of leather in front to protect the end of the finger. When the finger-tip as thus constructed is dry, it is stiff and retains the shape of the finger as though it had been formed on a last. Several trials may be necessary before a satisfactory fit is secured.

If the finger-tip be made to form a **parrot-beak**, the act of straightening the finger at the joint, at the moment of loose, holds the tip in place. The fit must be snug and comfortable, but not too tight. A loop of heavy thread at the rear will tighten a tip that is a bit too large sufficiently to prevent its slipping off.

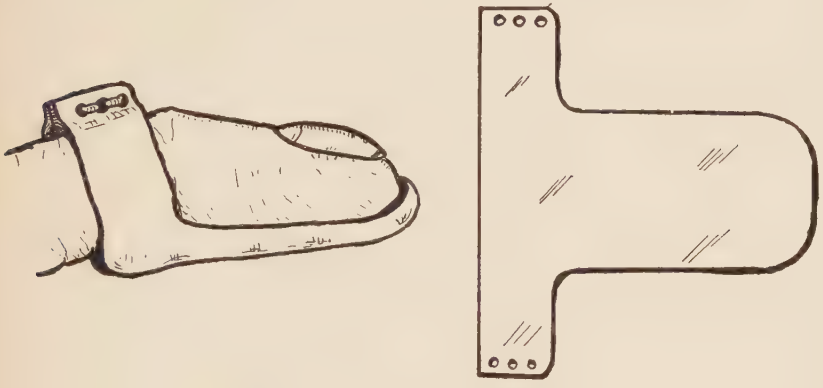


FIG. 32. AN EASILY MADE FINGER-TIP

The **parrot-beak** style of finger-tip, so made, is shown in *Figure* 31. The adjusting-loop is clearly shown. On this sketch we also show the **string-stopper**, a little hump of leather stitched to the inner surface of the tip, to prevent the string from slipping back too far. Some archers prefer finger-tips thus provided with string-stoppers, but the writer cannot indorse this supplement. It is unnecessary so far as his style of drawing and holding is concerned. This is described on *Page* 190.

If a little glue be rubbed inside the tip, adjacent to the pad of the finger, and the finger be moistened before the tip is forced on, it will not work loose, and control over the bowstring is augmented. A dab of hot glue is best. One application will suffice for several days' shooting.

A very simple and quickly made finger-tip is shown in *Figure* 32.

A still simpler protector is the old-fashioned tab. This is shown in *Figure* 33. It is cut from a bit of leather. The first and second fingers of the drawing-hand are put through the holes and the nock of the arrow is taken in the small notch. The leather then protects the tips of the fingers from the string.

Doctor Paul W. Crouch employs an articulated affair made from leather strips and rubber-bands, the whole being anchored to the hand by a wristlet. The purpose of this complicated affair is primarily to hold a set of regular finger-tips in place and keep them on in the proper manner during the moment of loose. This

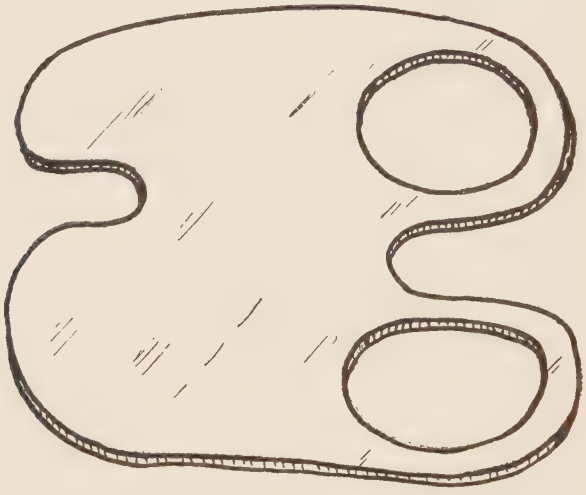


FIG. 33. THE TAB

"Glove" is clearly shown in the pictures of Dr. Crouch on *Plate* VI.

We personally think this device a bit too complicated, since the simpler parrot-beak tips, if carefully made and held on with a little glue, answer the purpose just as well and are far less liable to come out of adjustment. But to give Dr. Crouch credit where credit is due, we must admit that, as holder of practically all American records and the recognised nearest approach to the peerless Horace Ford, his shooting-glove must have merit!

Target-shooting is apt to last over considerable periods of time, and any one who, from false pride or other vainglorious reasons, abuses his powers, by reason of using bows that are too strong or who disdains proper protection to the important loosing-fingers,

is sure to pay the penalty for his foolishness before the day is over.

In search of good finger-tips the archer should experiment with any likely bit of leather that comes to hand. After making several attempts at fitting each finger, a set of three will finally be found that feel and act right—and these should be carefully guarded!

CHAPTER XVI

THE BRACER, QUIVER, TASSEL, NOTE-PAD, SCORE-BOOK, AND TACKLE-BOX

THE BRACER

A bracer, or arm-guard, is necessary to keep the left wrist from being bruised or lacerated by the bowstring.

Theoretically such protection is not needed, since the bow should be held so the string will not strike the wrist. But no matter how

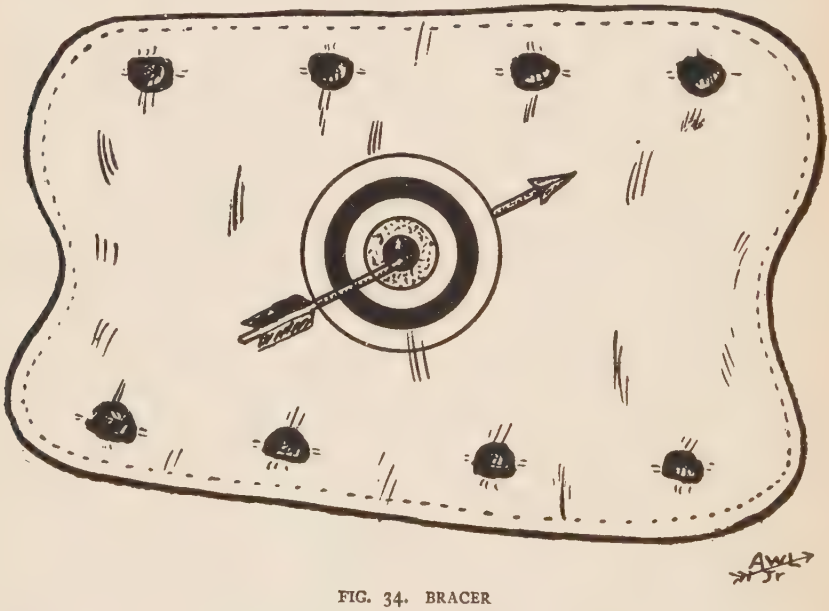


FIG. 34. BRACER

careful the archer may be in this respect there will be one or two times during the afternoon that he will get an unexpected cut, and a painful welt will result.

An examination of the pictures in this volume will show a variety of bracers in action. Also note that not a single archer of note appears before the target without one.

Bracers that require too much lacing or strapping to put on or take off are a nuisance. The most common kind seen for sale have two or three straps that are made fast by buckles. A very satisfactory bracer is made from a simple piece of fairly tough leather, cut to fit around the arm and wide enough to lap well over the back of the forearm. Several shoe-hooks are put in, and the bracer fastened in place by slipping elastic bands over the hooks. The pattern for such a bracer is shown in *Figure* 34. The face of the leather may be embossed or otherwise decorated.

The leather should be thick enough to prevent bruising, yet flexible for comfort, and smooth on the outer surface, to keep from abrasing the bowstring in event the latter slides against it. Care must also be taken to see that no buckles, straps, hooks, or other projections appear where they are in danger of catching the string.

Ladies frequently bruise their arms to the elbow when they first take to archery, and seek protection by procuring long "bracers" that project clear to the shoulder. This method of obtaining relief is wrong. The arm, instead, should not be locked. By hunching the left shoulder slightly this "double-jointed" locking of the elbow is avoided and the bow held with the forearm at sufficient angle to avoid the painful scraping.

THE QUIVER

The "quiver," as usually pictured by artists, is not used by the target archer. However, he does frequently use a receptacle suspended from his belt, just large enough to carry the six arrows he shoots with. This is called the service-quiver, a most convenient accessory that should be in the kit of every archer.

The service-quiver is almost any sort of convenient receptacle that can be called on to answer the purpose. It should be deep enough to hold the arrows from falling out when the archer walks or stoops over, but not too deep to prevent convenient withdrawing of the arrows for shooting.

Mr. Wm. H. Palmer, Jr., the present (1928) champion, is shown with his latest service-quiver in the lower left-hand picture of *Plate I.* We regret that we have no picture of the same gentleman as he appeared at the 1925 tournament with a long pasteboard box stuffed into one of his wife's stockings and affixed to his waistband with a large safety-pin.

Many men use their hip-pockets for this purpose *now,* but this is not so satisfactory as a quiver.

Stiff tube-like receptacles should be used for making service-quivers, instead of sheaths made from cloth, thin leather, or other flexible materials that close at the top and make it hard to place arrows in it.

The **service-quiver** and **arm-guard** are ideal subjects for manufacture by archers who are proficient in decorative leatherwork.

THE GROUND-QUIVER

This extremely useful device should be adopted by every archer. It is simply a stand that both holds the arrows upright at the **shooting-line** and marks the exact position at which the shooter should stand when he faces the target.

The most satisfactory **ground-quiver** is an iron stake about twenty-five inches long, with an iron ring about four inches in diameter at the upper end. The hole through which this ring is threaded should be square and a section of the ring itself made square to fit therein. This will keep the ring at right angles to the stake when set up. Slipping the square section to one side allows the ring to be folded against the stake for portability. See *Figure* 35.

A wooden stick fitted at the top with a wire loop is a simple substitute for the iron device. A wooden stake will soon lose its point, however, and is difficult to force into hard ground.

A particular archer shoots his arrows in a more or less regular and predetermined order. The ground-quiver affords a convenient aid to such selection.

THE TASSEL

A **tassel,** usually green, of woolen yarn is used to wipe mud and dirt from arrows as they are retrieved after each *end.*

It is very important to keep arrows scrupulously clean.

The **tassel** usually hangs from the belt, on the left side.

An ordinary rag will do for a while, but it soon becomes filthy. The woolen yarn, however, is self-cleaning. No matter how often it is used or how much mud is wiped from arrows with it, it sheds all dirt and cleans itself automatically.

As with other accessories, the tassel affords opportunity for fancy work. Men are continually called on to restring bows and do other little favours of muscular nature for the ladies. The

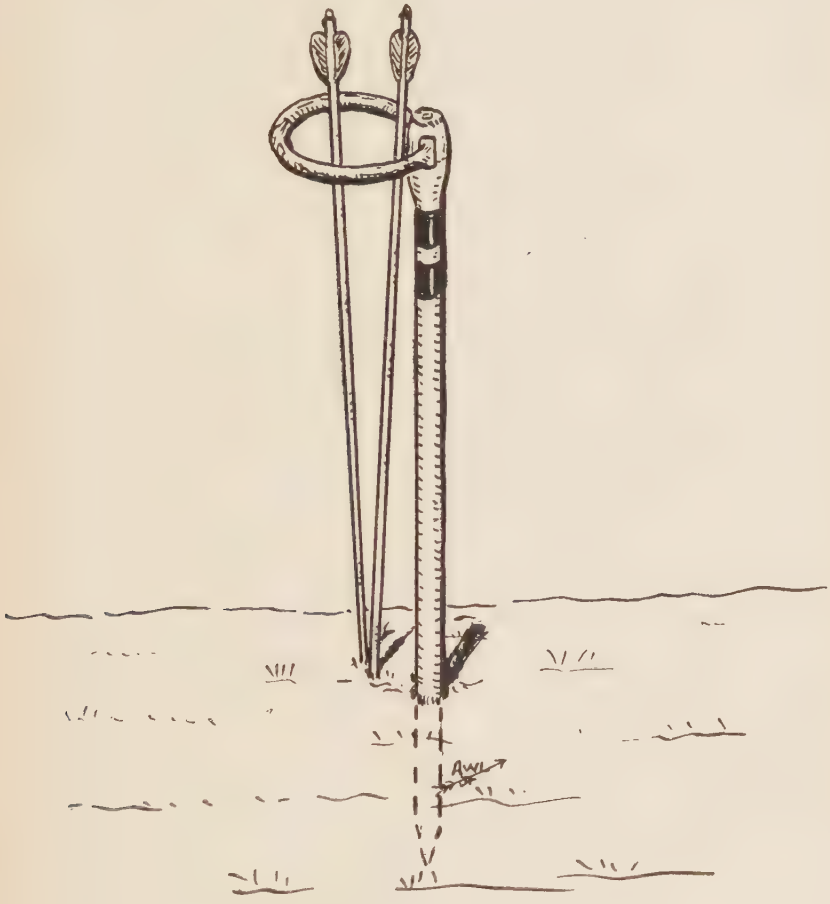


FIG. 35. THE GROUND-QUIVER

ladies, on the other hand, reciprocate by presenting elaborately made tassels to deserving gentlemen!

Differently coloured tassels also make excellent club insignia. However, dark colours, which do not soil easily, should be used.

THE NOTE-PAD

The archer who shoots mainly for pleasant recreation has little need for this device, which is pictured in *Figure* 36. However, we recommend its use by the archer who desires to study his work.

It is simply a block of notepaper with pencil conveniently attached, to be used for recording memoranda incident to shooting.

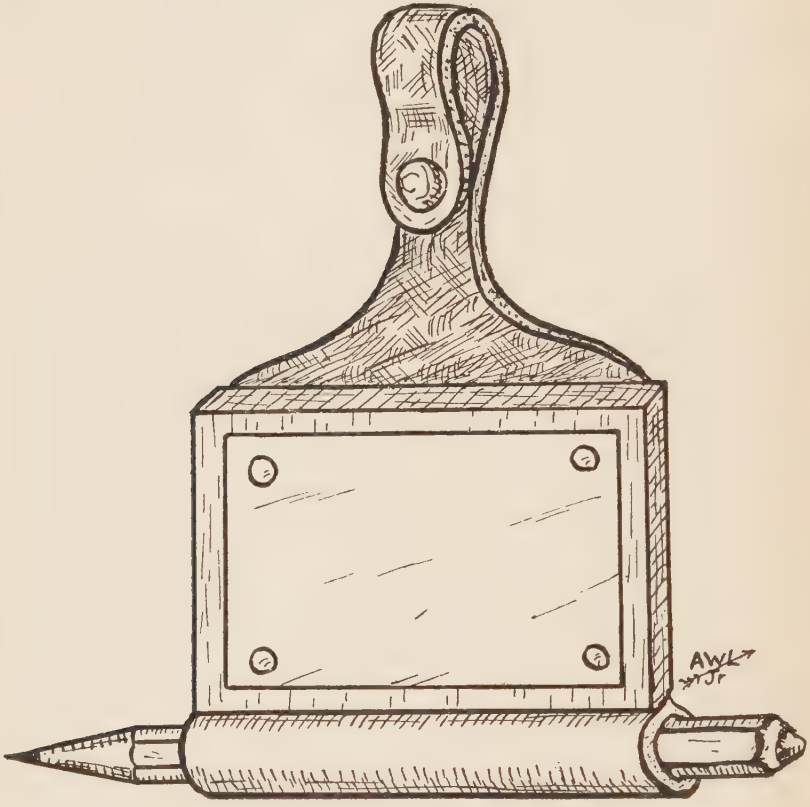


FIG. 36. THE NOTE-PAD

For the archer who desires to study what he is doing it is invaluable.

In *Chapter* XXXII, on the Strategy of Archery, we will discuss the necessity of keeping six arrows under one's constant attention. Expert riflemen keep a score-book in which every shot is recorded. The *note-pad* is of similar importance to the careful archer who aspires to see his name near the top of the score-lists.

THE SCORE-SHEET

The score-sheet is the most important accessory outside of the primary equipment of the archer. This may be of any convenient form. The score-sheet is to the archer what the bridge-score is to that game, or the score-card is to the golfer.

Unless a careful score is kept archery easily degenerates into mere shooting with a bow-and-arrow, and, just as rifle practice, would soon lose its interest if limited to shooting at casual targets.

By keeping score the archer acquires an incentive that keeps him interested in the game.

Half a dozen ends shot and scored are of far more consequence

Name Arthur W. Lambert Place Forest Park St. Louis, Mo.
Round Single American Date 7-17-27

60 Yds.	50 Yds	40 Yds	
6 - 24	6 - 36	6 - 42	
6 - 44	6 - 38	6 - 42	
6 - 44	6 - 40	6 - 50	
6 - 42	6 - 42	6 - 48	
6 - 44	6 - 48	6 - 48	
30 - 198	30 - 204	30 - 230	90 - 632

FIG. 37. SIMPLE SCORE-CARD

to the archer than a full afternoon of casual shooting, even though the latter masquerade under the guise of experiment or practice. It is the difference between the aimless amble and a walk with some definite destination.

Archers should keep a record of personal scores. By reviewing this record the memories of different rounds shot are not only recalled as pleasant recollections, but the archer profits in ability through a study of these records.

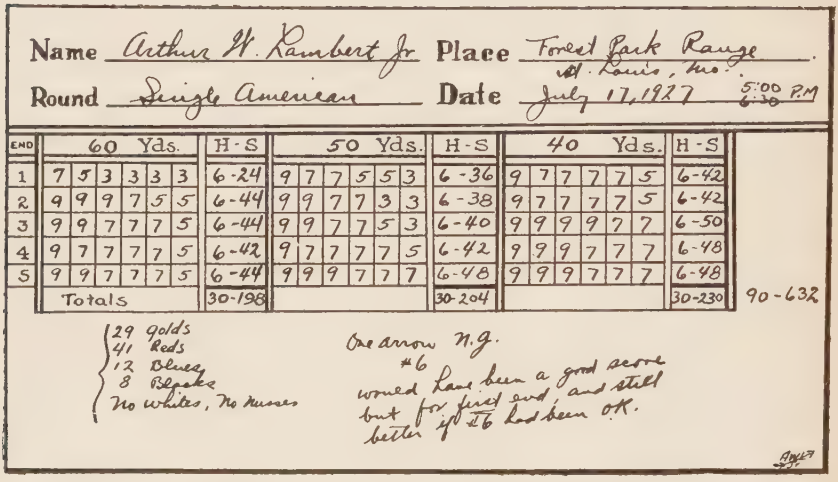
The easiest way to keep score is merely to jot down a summary of the results of each *end*. This records the number of hits and

the score—*by ends*. An American Round made by the writer last year is shown scored in this fashion in *Figure* 37.

It is much better, however, to record each individual hit. The same score is thus recorded in detail, as shown in *Figure* 38.

To some this may appear useless bookkeeping; but its great advantage lies in the value of the detailed record for summarisation and in planning new conquests aimed at higher totals.

It is just as interesting to know how many hits were Golds, how many were Reds, etc., as to know how different holes presented



Name Arthur W. Lambert Jr. Place Forest Park Range St. Louis, Mo.

Round Single American Date July 17, 1927 5:00 6:30 P.M.

END	60 Yds.						H-S	50 Yds.						H-S	40 Yds.						H-S	
1	7	5	3	3	3	3	6-24	9	7	7	5	5	3	6-36	9	7	7	7	7	5	6-42	
2	9	9	9	7	5	5	6-44	9	9	7	7	3	3	6-38	9	7	7	7	7	5	6-42	
3	9	9	7	7	7	5	6-44	9	9	7	7	5	3	6-40	9	9	9	9	7	7	6-50	
4	9	7	7	7	7	5	6-42	9	7	7	7	7	5	6-42	9	9	9	7	7	7	6-48	
5	9	9	7	7	7	5	6-44	9	9	9	7	7	7	6-48	9	9	9	7	7	7	6-48	
	Totals						30-198							30-204							30-230	90-632

29 golds
41 Reds
12 Blues
8 Bleaks
No whites, No misses

One arrow N.G. #6 would have been a good score but for first end and still better if #6 had been O.K.

FIG. 38. SCORE-CARD FOR AMERICAN ROUND

peculiar situations for the golfer; and a detailed score-card makes such analysing possible.

Clubs and organisations should provide formal score-cards for the rounds commonly shot. Mimeographed sheets can easily be supplied if printed forms prove too expensive.

No matter what form of score-sheet is used, the important consideration is to keep a score whenever you shoot, and to preserve these as a matter of record. You will soon establish a number of record performances which will prove incentives for future work. Your *best score* for the round itself, then your *best score* for each of the distances, your *best end* at each distance, and your *total number of Golds*. These statistics are interesting and will repay you many times over for the trouble taken at the time to record them.

THE TACKLE-BOX

The tackle-box is a receptacle for keeping arrows and other paraphernalia when not in use.

Space should be provided for a dozen or more arrows, so arranged that each shaft has an individual compartment in which it is held at three points to prevent warping.

The tackle-box is largely the product of an archer's personal ideas. No two are ever alike, although the same ideas prevail in all.

The box should be arranged to provide each item with a place of its own. There should be a particular place for the bracer, service-quiver, finger-tips, etc. Also places for wax, extra strings, oil, a few rags and the necessary tools for making field repairs.

While the bow and the arrows are the primary implements of the archer—and all that is necessary to *shoot*, the various accessories are of great importance, and are of such character that their assembling constitutes one of the charms of the pastime. The tackle-box and its contents more than anything else reflect the character and temperament of an individual archer.

CHAPTER XVII

CHAMPIONSHIPS, THE TARGET, AND COMPETITIVE SCORING

The standard target for competition is simply—**a four-foot circle divided into five equal and concentric rings.**

The diameter of the Gold is exactly 9 3/5 inches and the rings are each 4 4/5 inches wide.

It has been customary for many years to colour the rings **Gold, Red, Blue, Black** and **White**—Gold being the centre of the target.

Hits in the various rings are scored:

A hit in the Gold counts 9 points
A hit in the Red counts 7 points
A hit in the Blue counts 5 points
A hit in the Black counts 3 points
A hit in the White counts 1 point

This is the standard method of scoring that has been in effect for many years. Practically all English and American records are based on this evaluation of the rings.

That this system has survived from its inception to the present day is largely due to the fact that from a mathematical as well as practical viewpoint this evaluation is about the best that can be devised.

With the growth of rifle-shooting a target similar to the archer's target was designed. The familiar targets used for ordinary fire-arms to-day are also concentric ring affairs. But their chief difference from the archer's target lies in the evaluation of the rings —5, 4, 3, 2 and 1 being the usual system.

But since the difficulty in hitting the centre of the archery target is much greater than five times the relative difficulty in hitting within the white, a central hit should and does count for more.

The area of the **Gold** is just one twenty-fifth the area of the entire target face. If we, therefore, base the system of evaluation on a basis of true area proportions—the **Gold** should count for **25 points** if we give a hit in the **White** a score of 1 **point**—or unity.

The intermediate rings would then have relative values of: **Red** = 6.250, **Blue** = 2.777, and **Black** = 1.563.

At long ranges these values would just about represent the correct mathematical values of hits in the respective colours.

There would soon be two main objections, however, to such a system:

(1) At short ranges the expert archer who rarely hits outside the **Blue** would be given far too much credit for hits in the **Gold**—at the expense of the good archer who, though he seldom misses the target, makes comparatively few centre shots.

(2) It would be too difficult to add scores.

The 5-4-3-2-1 system of evaluation is based on a simple linear proportion; and for practical purposes this is all right for rifle practice, since the comparatively flat trajectory of the high-velocity rifle-bullet can be assumed to miss the bull's-eye in direct proportion to the displacement of the aim. But the archer can have *perfect line,* yet miss because his arrow went excessively *high* or *low!* He can miss in one or both of *two* dimensions; and corrections for error in elevation, particularly at ranges in excess of 60-yards, are greatly out of proportion to corrections necessary to compensate for errors to the right or left. Therefore, more nearly central hits should be given values figured on some more appropriate basis.

By arbitrarily giving the rings respective values of 9, 7, 5, 3, and 1 we recognise the superior ability of an archer who continually overcomes the difficulty of hitting consistently in the **Gold**—without handing him an undue advantage at the shorter ranges. We also give the rings simple values that can be easily recorded and totalled.

From a logical and practical standpoint no better numbering of the present target could be adopted. It has stood the test of time and all modern records have been made upon it.

In the early days of modern "Toxophilite Societies" targets of different sizes were used for different distances; but this practice was long ago abandoned to economy in target-expense.

THE POINT-SYSTEM

Numerous attempts have been made by various rules-committees to tinker with rules relative to the choice of archer to be adjudged "Champion."

The Grand National Archery Meeting, with the exception of the first meeting in 1844, has been an event at which a Double York Round was shot.

At the first five meetings the winner was the archer who turned in the highest total score.

At the sixth meeting, in 1849, the *Champion's Medal* was first awarded, and was won by Mr. Ford, who held it for eleven successive years. However, at this meeting the championship was awarded on a clumsy and unfair system of "points." Instead of simply taking the highest score and placing contestants according to their standing in this most logical manner, "points" were awarded as follows:

2 points each for gross score and gross hits,
1 point each for score and hits at 100 yards,
1 point each for score and hits at 80 yards,
1 point each for score and hits at 60 yards,
making a total of 10 points.

In this event Mr. Ford's score was 176-703 for the Double York Round. Mr. A. P. Moore, however, turned in a score of 173-747—which ought to have given *him* first honours. But Mr. Ford had five points, whereas Mr. Moore had but four.

A Mr. G. Attwood happened to make the best score at 100 yards!

This "robbed" Mr. Moore of the "point" that would have at least given him a tie with Ford—and the resulting championship, since his general shooting was better.

Mr. Attwood's third-place score was 149-615, far below that of either of the two leaders.

Mr. Ford retained the Champion's Medal until the seventeenth meeting, in 1860, when Mr. G. Edwards won with six points. At this meeting Ford took third place.

In 1861 Mr. Edwards again won with seven points, Ford dropping to fourth place

In 1862 Mr. Edwards again won with seven points, Ford, with three, being second.

In 1867 Mr. Ford became Champion again, for the twelfth and last time, with a score of 215-1037 and an award of eight points.

Since the fifth meeting, at which Mr. Ford won his first championship, there had been no complications in the scoring. But

in 1869 Mr. W. Rimington, with a score of 215-1037, won four points, and Mr. E. A. Holmes, with 187-883, was second in *score.* Captain C. H. Fischer, with 192-860, was only *third in score,* but won two points for score and hits at eighty yards and two points for most hits. This tied him with Mr. Rimington for point-score, but the former was awarded the championship on the basis of highest gross-score.

So, with the exception of the meeting in 1849, when Mr. Ford first won the Champion's Medal on a fluke, the winner had always made both greatest number of points and highest score. But the absurd mixup between the first three archers in 1869 clearly demonstrated the unfairness and clumsiness possible under such a system of award that the committee decided that "in the future the Champion's Medal should be decided by *gross-score* alone."

In 1870 Mr. E. A. Holmes became Champion with the highest score, under the rule passed the year before, and would have won with but one-third of a point, with 183-807.

But the onerous "Point-System" was reintroduced in 1871 and remained in force through 1886, according to the records published in Butt's edition of Ford's *Archery.* Since that time our records at hand give only the scores of the winners, and we do not know whether the award was under one system or the other.

REAL WINNER DEPRIVED OF CHAMPIONSHIP

However, on two occasions, between 1871 and 1886, the point system deprived the archer who had the highest gross-score of the championship, and in 1872 there was a tie for points, although Captain Fisher, whose highest score of 175-771, was adjudged the winner. On these two occasions: in 1879 Mr. W. Rimington, with 165-799, lost to Mr. R. Walters, who only made 187-729; and in 1884 Major C. H. Fisher, with 191-941, lost to Mr. C. E. Nescham, who only had 208-902.

On the occasions that resulted in all of these fluky awards of the Championship Medal, the archer who had the *highest score* lost two points—and the title—because another archer got *more hits,*—a matter of no logical consequence since the *hits* are mainly recorded as a matter of interest and should have no influence whatever on the score.

When the National Archery Association of the United States—

popularly known as the N.A.A.—was formed, it patterned its rules and methods on the English customs. From 1879 to 1910 the title was based on the Double York Round.

The new Double American Round was introduced in 1883, but did not figure in determining the Championship standing.

With the adoption of English ideas at the beginning, the N.A.A. fell heir to the influence of the "point-system," and with the exception of the second tournament, in 1880—which was decided by gross-score alone—the system prevailed until 1915. The clumsy practice misfired in 1882, 1888 and 1913, when—for the same reason chronicled above—a slightly smaller total of hits deprived the real winner, who had the highest gross-score, of the title.

From 1911 through 1914 *two* Champions were named. But as the winner of the Double York naturally claimed superiority over the "Champion" of the easier Double American Round on two occasions when the two were won by different archers, it was seen that no official fiat could provide for two "Champions" of equal rank and have its decision respected.

This led to the adoption of the present (1928) method of basing the Championship standing on combined performances in *both* the Double York and Double American Rounds.

UNFAIRNESS OF THE POINT-SYSTEM

If we judged a horse race by a method similar to the old English point-system of awarding archery championships, we might give the horse two points for finishing first and the horse who led at the three-quarter, half-way, and one-quarter post, respectively, one point each. We don't think such a system would be looked on with much favor in Kentucky, although it would benefit the occasional second-rater.

Adherents to the point-system were undoubtedly persons of less than championship calibre who hoped to profit through luck or some specialised ability at the expense of the real winner. Without a doubt the practice of having two "equal" champions in this country from 1911 through 1914 was in the nature of a compromise between different factions.

The present writer has attended all National Tournaments since 1925 and numerous minor ones and has heard many well meaning contestants proclaim that the long-distance shooting should be

abolished, since it makes the tournament "a contest of endurance rather than one of skill."

Were there intrinsic merit to such claim it would have recognition; but the real genesis of such contentions lies in selfishness. The support of any movement to do away with shooting at 80 and 100 yards can nearly always be traced to actual *lack of skill* necessary to hit at these noble distances.

Archery is not tiddledy-winks! It is a physical sport that requires excellence in many departments for best results. The strong man naturally has the advantage, and to seek to nullify this fact of nature tends to lower a sport of national scope to the level of a handicap affair in the worst possible manner.

The longbow is capable of reliable accúracy against a four-foot target at 100 yards. Shooting at such a mark from greater distances might be judged impracticable. Likewise, shooting with the average man's bow at a similar target from distances closer than 40 yards is too easy. If these contentions be admitted the adjudged Champion under any fair system of award should be the one who can perform in the most creditable manner at the rounds comprising the entire set of ranges between these limits.

The archer who has strength and endurance will have a great advantage at 100, 80 and 60 yards. The *skilful* archer of delicate physique can excel at the rounds involving fewer arrows at 60, 50 and 40 yards. But to excel at all distances, taken as a whole, requires a balancing of this so-called strength, endurance and skill.

It is erroneous to believe that because records of various tournaments show that the archer who won the York Round often found his name a bit down the list on the American Round total that the long distance man is not *also good* at the short ones too. As a rule, the archer who can win the York Rounds with an impressive margin can also win the shorter distance events—if he tries! At tournaments, however, the winner of the Double York usually has such a comfortable margin of safety that he is apt to take things easy, and does not exert himself at the American unless his total is in danger. For this reason the short distance devotees who seek any artificial advantage on the basis of stressing supposed contentions as to "superior skill" will not be likely to better their relative chances in the least.

Excellence in the York Round has always been considered the real measure of an archer!

The futility of trying to function under the dual standard was so apparent that in 1914 a new constitution of the N.A.A. was adopted. However, it is probable that adherents to the old point-system still persisted in opposition to the logical method. A still further compromise was probably necessary, so that, although the *gross-score* for the Double York and Double American rounds was adopted as the basis for determining standings—a newer, though lesser abomination was adopted: namely, the idea of adding the *hits* to the *score*.

This is the present method of adjudging champions in the National Tournament; but there has been a growing and determined sentiment of doing away with it. At the last (1928) meeting of the N.A.A. a committee was appointed to draft a new constitution, and it is now certain that this will put archery once and for all on the logical and fair basis of considering *nothing but the score*.

CHAPTER XVIII

THE TARGET: RING VALUES AND TARGET CONSTRUCTION

It is customary for archers to record their scores, and also to record the number of arrows that hit the target. Thus, a score for a single end (6 arrows) recorded "5-23," signifies that the shooter hit with five of his six shots, for a total score of 23 points.

Scores are published in archery journals:

Single American Round	60 Yds.	50 Yds.	40 Yds.	Total	Date
A. L. Brush, CosCob, Conn.	30-190	30-198	30-224	90-612	8-15
L. C. Smith, Newton Centre, Mass.	25-103	30-154	29-167	84-424	9-24

Such a record would tell that on August 15th Mr. A. L. Brush of CosCob, Conn., shot a single American Round. He made 190 points from 60 yards, 198 from 50 yards, and 224 from 40 yards, respectively. His grand total was for the excellent score of 612, and *all* arrows hit the target.

Similarly, Mr. Smith made a total score of 424 points as shown; but six arrows of the ninety missed the target. The report shows that he had five misses from sixty yards and one miss from forty.

These are actual scores taken from *Archery,* the official bulletin of the N. A. A. (Bulletin No. 102, October 1, 1927). Mr. L. C. Smith was, has been for a long time—and still is—the beloved Secretary-Treasurer of the N. A. A. His picture appears on *Plate I.*

Regardless of the "bookkeeping," the *only significant figure,* so far as their competitive abilities indicated is concerned, are the single figures "612" and "424." Those were the scores!

But at National Tournaments, to comply with provisions of what is generally considered an out-of-date and inadequate Con-

stitution—which is being rewritten at the present time, the writer of these lines being a member of the committee—the hits are added to the score to determine the championship standing. Thus, Brush would be given a total of 90 + 612 for 702, and Smith would be credited with 84 + 424 for 508.

If this practice was based on a logical reason there would be no objection to it. But it is not logical and is on the way to being discarded in favor of the only satisfactory system of basing championship standings, on the **score alone!**

It is customary for big league baseball scores to be published as:

		R	H	E
New York	0 0 0 2 0 1 0 0 0	3	2	0
Philadelphia	0 0 0 0 1 0 1 0 0	2	5	1

So far as results are concerned the significant figures are the "3" and "2." The others are merely statistical. If we add hits and errors to the score we get a "relative standing" of 5 and 8—which is akin to an archer adding up his hits and score.

In rifle-shooting competition it is customary to record the number of misses in reporting competitive scores; as, "Sergeant Jones scored a 482. He had but four misses in 100 rounds, for a possible 500." Were this an archery competition we would turn the thing around under present methods, calling his score 96-482 and put him down for 578 to get his standing."

The question arises: "How did hits get in the score column, anyway?"

There is a very good reason for recording them. If the reader will turn to the score-sheet shown on *Figure* 38 as he reads the next few paragraphs this will be made clear.

THE SCORER AND THE TARGET-CAPTAIN

When several archers shoot on one target, one acts as **scorer** and puts down the value of each hit as the arrow is withdrawn. The **target-captain** draws the arrows and names its value as he pulls it. The scorer repeats this and writes down the value in its proper space. The inner arrows are drawn first. It is customary for the person drawing the arrows to make a distinct pause, or say "and," as he calls the last arrow.

The **score-keeper** is thus enabled to write down the hits in

proper order—without looking up from his pencil. And as a check that all arrows in the target for the archer whose end is being recorded are accounted for, he will call out, "six hits?" Or whatever their number may be. Then if there be a mistake it can be corrected before proceeding. The figure "6" is immediately recorded as a matter of custom. But the total *score* of the hits need not be added till later. This is frequently done while walking back from the target. From this very good practice the custom of recording the number of hits probably originated. But the fact, like recording "hits" with baseball scores, should have no value on the scores themselves.

We have dwelt at length on the subject of hits and score, mainly to impress beginner and student of scientific archery with the splendid fairness of the time-honoured evaluation of target-rings, and the unfairness of certain abuses that tend to creep into the game. We wish to lend our influence to what are logical methods; and to dissuade well-meaning but illogical tampering in the future by selfishly inclined or improperly informed committees-on-rules.

Although the Constitution of the N.A.A. specified that the Championship should be determined by adding hits to score, in no other official capacity did hits have other than a recorded, or statistical, recognition. And at no other time were the two items added. Experienced archers in comparing their scores simply mentioned *score* totals; and hits were seldom brought into the conversation unless there was some peculiar interest in quoting them.

With the recent increase in archery, new clubs have sprung up in communities where no experienced archers could be found. These wrote N.A.A. headquarters for information, rules, and advice. They received copies of the old Constitution, and in interpreting the articles as best they could stumbled onto the "hit and score" clause and took it literally. However, *instead of adding the two at the end of a round or match,* the two were added at the end of each six arrows and included in the reported total as score. As this gave a *bigger* score to talk about, it was a practice that easily spread unless corrected.

In one locality—where the archers had experience and should have known better—the careless and misleading habit of referring to *gross-totals* as though they were *scores* was very misleading. So much so that whenever archers at certain recent tournaments mentioned scores they had made in the various rounds that seemed

higher than ordinary, it was always asked whether the figures named were "honest to goodness scores," or "Podunk totals."

FALLACY OF ADDING HITS AND SCORE

In the last analysis the adding of hits to score is nothing more nor less than *adding an additional point to the value of each ring.* It simply gives the rings an evaluation of 10, 8, 6, 4, 2!

This reduced to lowest terms gives us simply 5, 4, 3, 2, 1!—the simple linear evaluation that was discussed on *Page* 139.

Since it was determined long ago—before archery even began in the United States—that 9, 7, 5, 3, 1 was the best practicable system! Since this evaluation has proven satisfactory all this time! Since all past records, both in England and in the United States are recorded on this basis! It is best to recognize facts and not permit an illogical innovation to undermine the basic foundation of the sport.

HITS BETWEEN TWO COLOURS

When archery first became popular as a pastime in Britain, arrows that cut the line between two colours were scored according to the lesser value. However, it has been the rule of modern societies to give it the value of the greater. This is based on the logical idea that the object shot at *was hit.* If the target were a soap-bubble, for instance, it would explode no matter how slight the graze—one could not deny that a *hit* was made! The same rule applies to target-shooting with the rifle, even to the extent that a ricochet or an accidental discharge that pierces the scoring-face of the target counts for full-value.

THE TARGET-FACE

The archer's target is usually painted on cloth. Sign-cloth is commonly used; but oil-cloth is hardier and lasts longer.

Dry colours can be obtained at any paint store. We use gold radiator-paint for the **Gold**; vermillion for the **Red**; white-lead tinted with ultramarine for the **Blue**; lamp-black for the **Black**; and white-lead for the **White**. These are ground to a paste-like consistency in ordinary bronzing liquid, then thinned with more

bronzing-liquid and turpentine. This paint dries in a few hours, with a dull flat finish.

The face should be carefully centred on the boss, then sewed at the edge. A layer of wrapping-paper should be placed between the face and the straw.

A target-face is serviceable so long as arrows can be definitely scored.

TARGET-BOSSES AND BUTTS

Backings for the target-face have taxed the ingenuity of archers for many generations. Inventors of different target-bosses come and go, but the straw mat survives as the only practicable target yet devised. It is simply a heavy mat made by forming straw into a rope, then sewing it spirally until the desired diameter has been obtained.

This sounds easy. But the making of a good target-boss is the most onerous and back-breaking job incident to the manufacture of archery tackle.

Almost any grade of straw, hay or similar material can be used. The chief consideration lies in working the material right. Specially cut, straight, unthreshed rye straw makes the best targets. Wheat straw is next. Broom corn makes excellent targets, but is very difficult to work with and expensive. Baled straw, the most readily obtained material, can be used, but is usually too short, broken and full of chaff.

The only satisfactory substitute for the regulation circular target-boss of straw is the butt. This is a permanent backstop. In early times butts were made by packing earth and sod in a wooden framework. A much better butt, however, is made by stacking baled straw as shown in one picture on *Plate* III.

A butt made of six bales of straw held together in a wooden frame, tilted slightly backwards, makes an ideal backstop, since even arrows that miss the target, unless exceptionally wide of the mark, are caught and do not pass into the grass beyond. This prevents lost arrows. The only disadvantage is lack of portability.

With such butts the chinks between the bales should be well stuffed with loose straw; and the target-faces should be painted on rectangular sheets of cloth, to be fastened in place from the corners.

THE FIRST LESSON

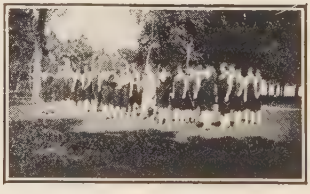
ARCHERY AS A LAWN SPORT

A. L. BRUSH
Winner of Double
York, 1928

ARCHERY IN CAMP

PROF. CHARLES D. CURTIS
Shooting over 400 Yards

MR. HICKMAN'S ME-
CHANICAL-ARCHER



ARCHERY CLASSES AT SAN JOSE TEACHERS COLLEGE

THE SHOOTING MACHINE

BOY SCOUTS AT PRACTICE

PLATE III

The purpose of the boss or butt is to receive *and hold* the arrow. The arrow itself marks the position of the hit, not a hole, as with firearms.

The shaft must penetrate far enough to stick in place, but the boss must be hard enough to keep it from going clear through. A leaky target is a nuisance and destructive to arrows. And a target that causes excessive rebounds is useless. Thus, a target-boss made of quilted, rather than parallel-fibre construction, is useless. Excelsior, cotton-batting and such materials cannot be used. Neither should the front surface be covered with burlap, heavy cloth, or other material that hinders penetration.

The diameter of the boss should be at least two inches more than the net diameter of the target-face, to allow hits on the edge of the white to remain in place without glancing off. This excess width is called the "petticoat."

A regulation target ought to be about four inches thick. It should have no soft spots.

STRENGTHENING A WEAK TARGET

A target naturally weakens with use, and soft spots develop. A loose target can be tightened by reefing the stitches. If the cord with which the target was stitched is weak or broken, re-sewing with new cord will rejuvenate it.

A four-foot target is damaged far more by careless handling than by shooting into it. Rough handling, such as rolling it back and forth from target-house to shooting location, ruins far more good targets than arrows.

An old or weak target can be backed up with a piece of celotex or beaverboard in an emergency, to prevent "throughs" or to stop arrows before the shaft penetrates to the feathers. This supplemental backstop should hang loosely, about six inches behind the target itself.

An expert archer will be hard on the Gold, leaving the remainder of the target practically undamaged. In this event, hang a supplemental mat behind the weak spot.

CARE OF TARGETS

On private grounds it is much better to leave the target in position permanently. No moving then is necessary—nor is it neces-

sary to get it out and put it in position for a casual bit of shooting. This saves a lot of work, but it chiefly saves wear and tear incident to moving the unwieldy target. If left out in the weather, though, cover the target with a tarpaulin or other waterproof cover to protect it against rain and dampness. A target thus cared for will last two or three years.

If the target must be put away when not in use, carry it carefully and hang it up. A rye target should be protected from rats and mice.

A rope handle at the back makes for easy handling. The handle should be adjusted to allow it to be thrown over the apex of the tripod. This helps hang it in place and prevents the wind from blowing it off at the top.

SMALL TARGETS

For casual practice, particularly where the target must be transported in an automobile, a regulation four-foot target is out of the question. A three-foot size can be used. Smaller targets are so hard to hit at any reasonable distance that they are impracticable. If a three-foot boss is used the target-face should have its **Gold, Red** and **Blue** rings painted in regulation size, omitting the outer portion of black and white.

For indoor practice or shooting in a small back-yard, there is no better butt than a single bale of hay stood on end. An 18-inch circle divided into five equal rings makes a miniature target that is just one-third actual size. For indoor work, if the distances be measured in feet—instead of yards, "standard rounds" can be practiced with almost true relative scoring difficulty as at the outdoor four-foot face.

TEMPORARY TARGETS

While the smaller targets serve admirably as marks, all competitive shooting and comparative scoring is done at the four-foot regulation circle.

Every beginner sooner or later wishes to try his hand at making a score under proper conditions, but the lack of a four-foot target prevents. For such as this a very good temporary butt can be made by gluing several thicknesses of corrugated box-board to-

gether and painting the face directly on this built-up backstop. Such a target will last for several hundred hits. In fact it will last indefinitely for the novice of average ability if he uses it legitimately, as his hits are widely scattered.

The writer is at present using a target so made, of four thicknesses, made from small pieces cut from corrugated shipping boxes. It holds his arrows very nicely now, but will soon be useless, as the majority of hits are within the red and gold rings; but for a beginner it would be satisfactory for a longer time. This target was made quickly in an emergency to test some arrows.

Mr. Hickman has used a similar target in conducting tests with his "mechanical archer" and for target-work as well. Six or eight thicknesses of board are used; but they are sewed together around the edges. When the target gets full of holes the disks are cut apart and rotated. This breaks the register of the holes. It is then resewed.

These substitutes, however, are not so satisfactory and cost more in the long run than a first class regulation article. For club use they are a waste of time.

THE TARGET-STAND

A target-stand can be easily made. The regulation stand is shown in *Figure* 39. Three pine boards, six feet long, about three inches wide and one inch thick are obtained. The lower ends are cut at an angle, so they can be forced a little way into the ground when the stand is set up.

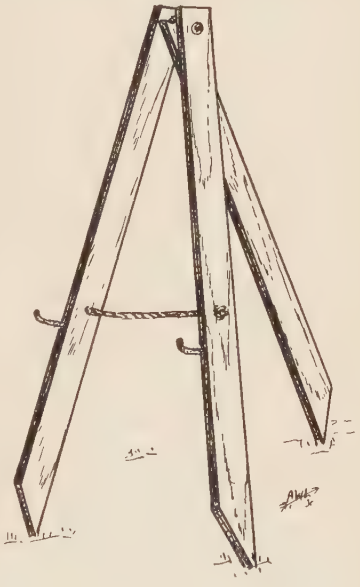


FIG. 39. TARGET-STAND

A hole is bored through the upper ends and a four-inch bolt put through to hold the stand together at the apex.

A target-rest, like the pegs on an artist's easel, should be put in the front edge of each of the two front (outside) legs, about three feet, nine inches from the top. A long spike will serve for this peg or rest, but a much better one is made by straightening

a heavy hammock-hook into a curved shape, as shown in the figure.

If the centre, or back leg is made about six inches longer the stand will have a firmer foundation, but will not be as convenient to store or move.

The front edges of the two front legs *should be left square.* If an arrow hits one head-on it will simply stick in and chip away a bit of stand; but if the front edge is bevelled (as some novices make them) a glancing blow results that easily snaps the shaft in two.

Under no circumstances should iron target-stands be used—if you value arrows.

If any wind is blowing, anchor the target and stand by passing a bit of rope over the apex and tying it to a peg driven in the ground beneath it.

It is sometimes awkward for a single person to put a heavy target in place. This act is facilitated by first putting the target on one foot, letting the foot assist in balancing and lifting during the operation. If the target is too heavy, draw out the back leg and let the stand lie flat on the ground. The target can then be put in place and the stand pushed up again into position.

When the target is in position the centre of the Gold is supposed to be four feet from the ground. The target-stand just described insures this within practicable limits.

No portion of the stand should appear above the target. This precaution eliminates many broken arrows.

CHAPTER XIX

THE SHOOTING-FIELD

The two important considerations of the **shooting-field**, or target-range; are (1) **level ground**, and (2) **sufficient length**.

The field must also be free from obstructions that would divert the flight of an arrow. With these simple qualifications cared for, almost any piece of ground will do.

The American Round requires shooting at sixty yards. This distance should, therefore, be obtained if at all possible.

The York Round calls for shooting from 100 yards. If it is possible to obtain this extreme distance, by all means do so—even though it be for a single target. Sooner or later an archer will desire to try his hand at the longer ranges.

The distances between shooter and target are measured from the **shooting-line**, which the archer **straddles**, to the **target-peg**, supposed to be under the **Gold**.

Ample free space should be left behind the target to stop arrows that go by. This back area should be perfectly *flat*. Bunkers and terraces to stop the arrows are excellent in theory; but practically these cause more trouble than they avoid. In hot weather the arrows soon wear away the turf behind a permanent target-position, and a bunker deflects the fast-speeding shaft still farther than it would naturally go before stopping.

Different archers have different heights of trajectory to their flights, and their respective arrows, shot from the same distance, come down at different angles and at different distances behind the target. A soft mound, so placed that it stops the shafts of one is not properly placed to catch those of another. Even so, the terrace soon hardens and becomes a nuisance.

BACK-STOPS FOR ARROWS

The ideal "back-stop" is closely cropped turf on soft ground. But arrows will even "snake" under this and hide, just as in taller grass.

A most satisfactory stopping device for misses is a *hurdle,* or low curtain of burlap. It needs be only a foot high, and should hang loose at the bottom. Two or three such hurdles, ten yards apart, in rear of the target, as shown in *Figure* 40, will stop nearly every arrow and leave it in plain sight on the ground.

After an archer has mastered the rudiments of the sport he will rarely miss the target by more than a foot or two on either side.

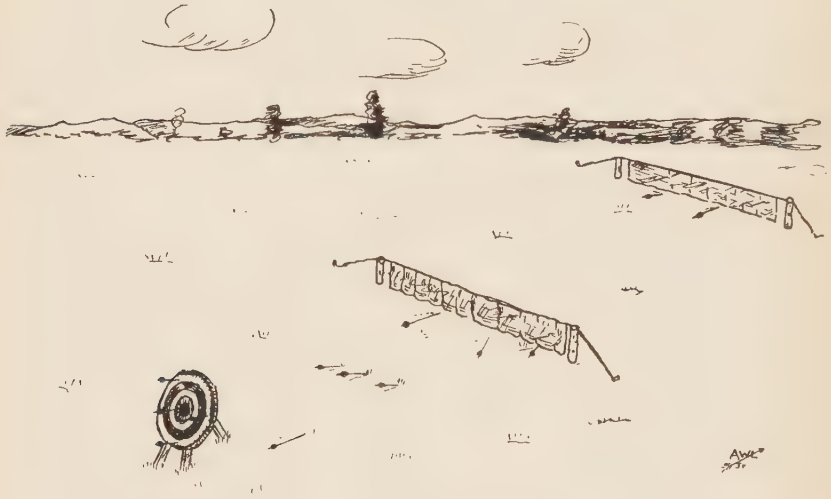


FIG. 40. BACK-STOPS FOR ARROWS

"Keeping a length" is more difficult than "keeping the line." Therefore, *length rather than width* is the important consideration in choosing a site for the target-range.

If more than one target is to be used the target-lanes should not be less than fifteen feet wide. Twenty-five feet is better. A line of closely crowded targets is confusing to the aim.

Six archers of average ability can shoot at a single target at the same time. If more than this number shoot, those on the flanks will find the angle too great.

With more experienced shooters four at a time is about the limit. Otherwise too many arrows will be in the target for convenient scoring.

At formal tournaments, although four archers customarily use each target, only one shoots at a time. But on more sociable

occasions, when recreation time is limited and targets are not too plentiful, all line up and shoot at once.

ENGLISH AND AMERICAN ENDS

In England it has been customary to shoot **going and coming.** That is, two targets are used, one at each end of the field.

An archer shoots **three** arrows, which they term an "end." The shots made in going down and coming back, termed a "double end," constitute a scoring block similar to the American **end.**

In the United States we use a single target and always shoot in one direction. This allows for economy in target expense. It is also far safer. A dead-line can be established at one end of the field, behind which spectators and non-shooting archers can be grouped in safety. Bows never shoot backward or "go off accidentally"!

The American archer shoots all six arrows at one time. However, at formal tournaments each archer shoots **three,** gives place to his target-mates, and shoots his **second three** again in turn. Thus a comparison of scores shot in the two countries are made under approximately even conditions.

An **end** of six arrows is the unit of all scoring in the United States. In summarizing an end the first figure records the number of arrows that hit. After the hyphen is recorded the score. An **end** of **6-54** would therefore denote a perfect end—all hits and each hit in the **Gold** for **9 points.** It is common for good shots to put down the figure "6"; but the best of archers rarely if ever put down the "-54."

The first "perfect **end**" ever made at a National Tournament was made by Dr. E. K. Roberts of Ventura, Calif., at the 1928 meeting at Rye, N. Y. A picture of Dr. Roberts and this remarkable end is shown as the central picture of the *Frontispiece.*

The writer believes that an archer shooting under the English system has a decided advantage in using only three arrows. It is comparatively easy to obtain three shafts that fly nearly alike and to remember the individual whims of each. The American archer, however, must keep six different shafts and six variations of aim in mind. And it is far more difficult to obtain a set of six arrows that shoot somewhat alike than three.

The American archer, however, need bother with but a single point-of-aim, has light from the same direction for all shots, and needs to adapt his psychology to but a single landscape. Thus the two systems may be said to practically balance.

Shooting "going and coming," using six arrows each way, would combine the two systems and apparently speed up the shooting. We wish, though, to discourage any such idea. Aside from the

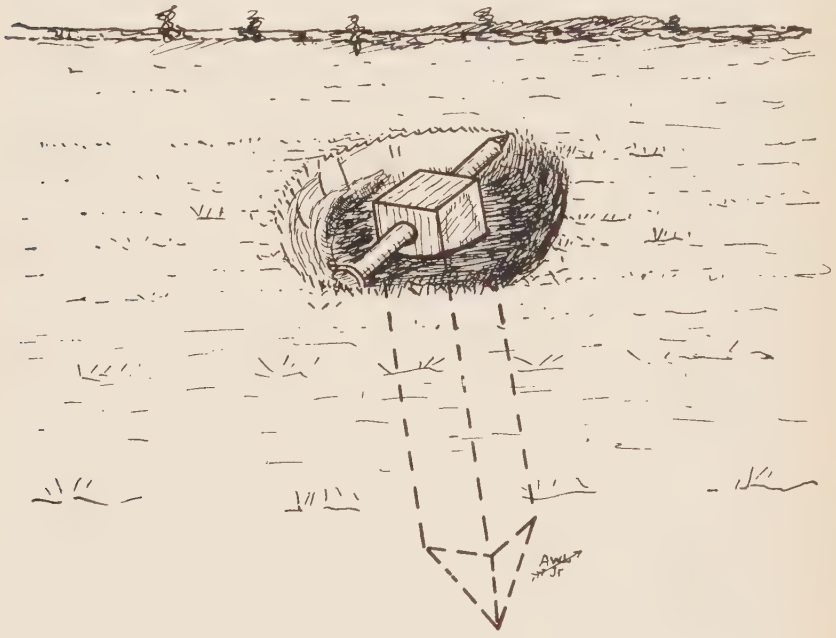


FIG. 41. TARGET-PEG

danger involved on crowded ranges, such practice would be detrimental to the archer.

As each archer habitually uses a bow that taxes his full powers of drawing and loosing, the walk to retrieve his shafts between ends gives his fingers time to rest and recuperate.

The present writer, as will be gleaned from other passages throughout this book, uses a bow that is well within his command; yet, even while practising from 100 yards, he rarely yields to the temptation to discharge more than six shafts in succession without giving his fingers their much needed rest.

LAYING OFF THE RANGE

A public or club range should be carefully surveyed and all points of importance permanently and plainly marked.

The range may well be marked off with lime, like a football gridiron.

The **target-line** should be plainly marked, and **target-pegs** provided to mark the exact position for each target. A good type of peg is shown in *Figure* 41. As with all other pegs and markers,

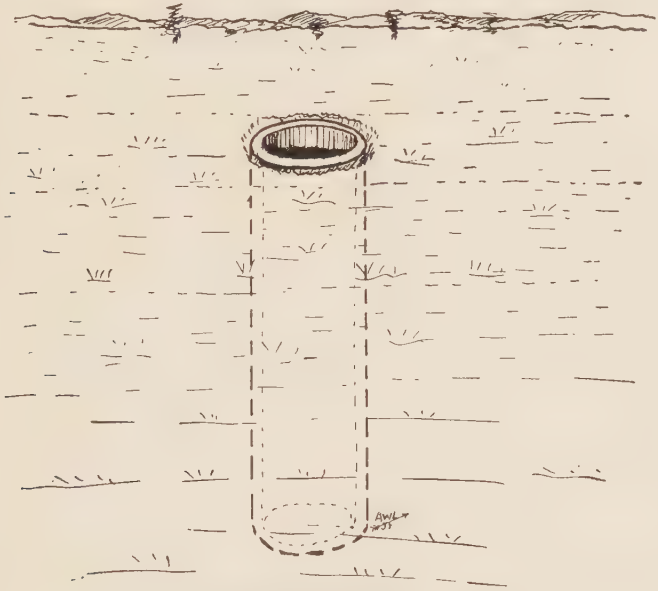


FIG. 42. SOCKET FOR POSITION-MARKER AND BOW-RACK

it should be sunk with the top below the level of the ground, so as not to interfere with lawnmowers and rollers.

The target-peg also serves as an **anchor**. A hole sufficient to easily pass a large spike is bored near the top. This nail is used as a cleat for holding the anchor-rope that prevents the target from being blown over by a heavy gust of wind. If such a "calamity" happens while arrows are sticking in the target it is seldom forgotten, as the arrows are almost surely broken.

The **shooting-lines** should be laid off parallel to the target-line. There should be one at 30, 40, 50, 60, 80 and 100 yards.

Each **target-lane** should be marked at least with a short white

line crossing the shooting-lines. It is unnecessary to carry these lines clear down the field,—but it is a safety precaution, as they serve to keep the archers who have gone to the target to get their arrows from inadvertently getting in front of another target at which some one might be shooting.

It is a good idea to mark the intersections of shooting-line and target-lanes with short lengths of 1½-inch diameter steam-pipe, as shown in *Figure* 42. These serve as sockets in which lane-posts or bow-racks can be placed. The latter are great conveniences as they provide racks on which archers can hang their bows while they go to get their arrows and score the hits.

The ground plan of the present range of the St. Louis Archery Club at Forest Park, St. Louis, Mo., is shown in the diagram, *Figure* 43.

In the past, at the more important tournaments, it was customary to vary the aforementioned plan in that shooting was all done from the same shooting-line and *the targets moved forward with each change in range.*

This was done in the interest of spectators.

However, there is a distinct tendency toward the easier method, in which the targets once set remain permanently in place.

A most important detail in laying out a target-range is to put the **target-house,** or storage-shed for the targets, **as near the target-line as possible!**

No matter where the main club house may be, erect the target-shed right at the line itself!

Four-foot targets are very heavy and clumsy to carry, and the distance they need be transported should be minimised in every possible way.

Where possible the range should be laid off with due regard to the sun. As most archers are right-handed and shoot in the afternoons, it is best to run the field north and south, with the target-line at the **north** end. Otherwise run it east and west with the targets at the **east.** This will arrange matters to keep the strong rays of the sun from blinding the shooter's eyes.

THE TARGET-HOUSE

The **target-house** need not be an elaborate affair. Only a weather-tight shed is necessary. It should be large enough **to**

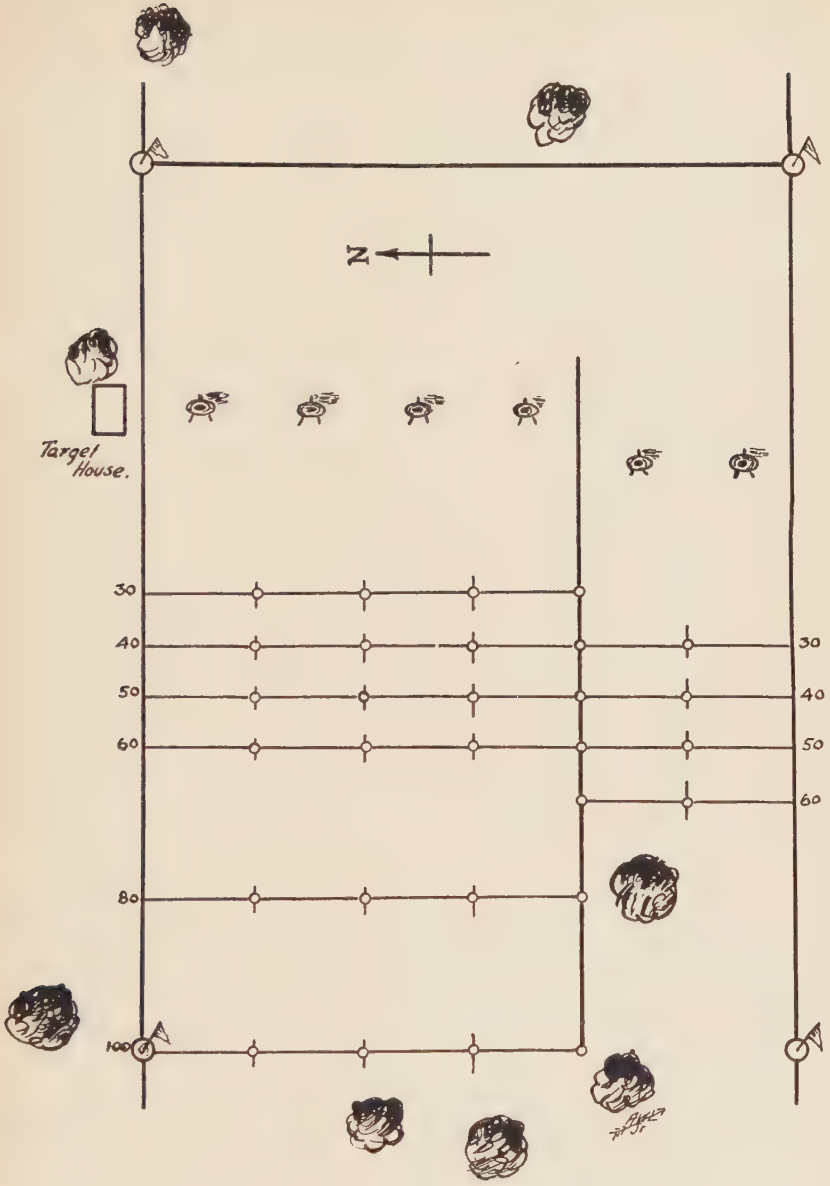


FIG. 43. ST. LOUIS, MO., ARCHERY CLUB RANGE

house the club's targets and other ground paraphernalia. Headroom sufficient to allow standing the tripods upright should be provided.

If a good lock is placed on the door and members furnished with individual keys, the most convenient means for private individual practice at odd moments is assured; for then archers may visit the grounds at any convenient time, get out a target, and start shooting.

More is learned by the student of archery when he shoots alone than on more sociable or formal occasions. So both on club ranges and on school grounds, individual practice should be encouraged and made as convenient as possible.

Besides being a convenient place for storage, a neat little target-house is a welcome shelter in event of a sudden shower.

A good location for the target-house requires that the floor be raised above the surrounding ground level, to insure good drainage. The targets themselves should be hung clear of the floor if possible. They must also be protected against rodents and insects. *The grain kernels in good rye straw attract rats and mice,* particularly in winter when the ground is frozen and their normal forage is destroyed. Baited traps will help exterminate these pests. A liberal sprinkling of sodium fluoride around the walls of the shed and about the targets will help serve as a barrier against insects.

CHAPTER XX

RULES FOR TARGET COMPETITION

To standardise target-shooting, so scores made by archers in different localities can be compared, certain games have been adopted. These are termed "rounds." They constitute certain definite numbers of arrows, shot in a specified manner from stipulated distances.

The most important round—and the acknowledged test of the archer, is the **York Round**. It consists simply of:

72 arrows shot from 100 yards
48 arrows shot from 80 yards
24 arrows shot from 60 yards

This round was adopted in 1844 for general practice, and has been the basis of all modern competition. It was devised by the archers of York, in England. The odd numbers of arrows at the different distances had their origin in the supposition that an archer ought to make approximately the same scores at the three different ranges if he shot six dozen times from 100 yards, four dozen from 80, and two dozen from 60.

This relationship is approximately true so far as the 100- and 80-yard shooting is concerned, but it requires more than the allotted two dozen arrows to equal at 60 yards the score a good archer of to-day will make at the longer distances.

This fact is an indirect indication of the superiority of the modern archer, so far as pure accuracy is concerned, over those of older times.

Although the York Round is the backbone of modern target-shooting, the York Round itself is not always apropos. Other rounds, therefore, have been devised.

WOMEN'S ROUNDS

In general women cannot use bows strong enough to give satisfactory results from the same distances shot habitually by men.

So the more important rounds for men have their counterparts in rounds for ladies. The **National Round** might be termed the "Ladies' York," and the **Columbia Round**, "The Ladies' American."

That special rounds have been designated especially for ladies does not indicate that ladies do not frequently shoot the same ones as the men. They frequently do! And make excellent scores! In team competition ladies often belong to a team and shoot as "men."

The most popular round shot in the United States is the American Round. This is the standard short distance game for men. It was devised to provide a short, interesting round that could be shot on ranges available in congested localities, a full 100-yard range often being exceedingly difficult to find.

Where it requires at least three hours to shoot a York Round under normal conditions, an archer can easily finish a single American Round in one hour.

For archers who desire to practise at the longer ranges, but who haven't time for shooting the full York, the St. George's Round is available.

Another one frequently shot is the Team Round. This was formerly called the "Ohio Round." Why it was ever called the Team Round is a mystery, except that it has been the usual team competition at N.A.A. tournaments. In matches between teams of archers, *any* predetermined round or combination of rounds can be decided on.

In the Team Round all shooting is done from one distance —sixty yards. It is a particularly interesting round for an archer who is shooting by himself to practice at. The entire ninety-six arrows can be totalled in four sets of four ends each, and the archer who finishes his first set, or block, will have a schedule before him that will serve as a pacemaker for the subsequent three.

THE METROPOLITAN ROUND

The Metropolitan Archery Association of New York City recently devised the **Metropolitan Round.** As their tournaments are limited to week-ends, time does not permit the shooting of both York and American Rounds. It was necessary to have shooting at the longer distances in order to present a well-balanced

tournament, so they devised the round that now bears the name of their association. It is a round that admirably suits modern short tournament conditions.

It will be noted that both the Men's and Ladies' Metropolitans contain the regulation American Round, so that no loss in ability to compare scores is suffered by archers wishing to keep tab on their progress in the most often shot round in this country.

Numerous other rounds have been devised and discarded from time to time. But those alluded to are the only ones that need present consideration.

In spite of the different games enumerated let us emphasise here again that the basic foundation of archery in this country rests on the **York** and **American** Rounds for men, and the **National** and **Columbia** Rounds for women.

The different rounds enumerated above consist of the following:

FOR MEN

1. **York Round**	72	arrows	at	100	yards
	48	"	"	80	"
	24	"	"	60	"
2. **American Round**	30	"	"	60	"
	30	"	"	50	"
	30	"	"	40	"
3. **Metropolitan Round**	30	"	"	100	"
	30	"	"	80	"
	30	"	"	60	"
	30	"	"	50	"
	30	"	"	40	"
4. Team Round	96	"	all at	60	"
5. St. George Round	36	"	"	100	"
	36	"	"	80	"
	36	"	"	60	"

FOR LADIES

1. **National Round**	48	arrows	at	60	yards
	24	"	"	50	"

2. Columbia Round	24	arrows	at	50	yards
	24	"	"	40	"
	24	"	"	30	"
3. Metropolitan Round	30	"	"	60	"
(Ladies)	30	"	"	50	"
	30	"	"	40	"
	30	"	"	30	"
4. Team Round	96	"	all at	50	"
(Ladies)					

Besides these standard rounds a few especially designed for Junior archers have been established. The Boy Scout qualification round for merit badge competition is 30 arrows each at 50, 40, and 30 yards. The Junior Metropolitan is 30 arrows each from 40, 30 and 20 yards.

The rules for archery competitions have been crystallized in the United States as given in the following table. These are based on the established rules as followed by the National Archery Association and the prevailing customs or hitherto unwritten laws of the game.

We shall state these rules herein with explanatory comments to assist new archers in a correct interpretation of their meanings.

STANDARD RULES FOR ARCHERY COMPETITION

1. All shooting shall be done at the regulation target. This target is a *four-foot circle,* divided into five equal and concentric rings. The value of the colors shall be: *Gold—9, Red—7, Blue—5, Black—3, and White—1.*

2. The centre of the *Gold* shall be four feet from the ground, and over the target-stake.

3. The *shooting-line* shall be measured in yards from the target-stake, and level with it. Archers straddle the line in shooting.

4. Each archer shall shoot at one time 6 arrows, called an *end.* In practice, to save time, several archers may shoot at a time at each target, and each shall discharge his arrows at will.

In formal matches all archers on the same target customarily shoot in turn from the same position. Also, instead of shooting all six arrows, each archer shoots three, yields place to his target-mates, and shoots his last three again in turn.

5. When all archers have completed their ends, the archers go to the target to recover and score their arrows.

6. An arrow must be left in the target until it is scored.
Usually one archer on each target acts as *Target-Captain,* and a second as *Scorer.*
The Target-Captain supervises the drawing of the arrows and his decision, unless there is a Field-Captain who acts as general referee, is final.
The value of each hit is recorded on the score-sheet (as suggested on *Page* 136). The central hits are drawn first, then arrows in successive rings outwards.
After the hits are recorded the number of hits for the end and the added score is put down in the column reserved for this purpose.

7. If an arrow cuts two colours it shall count as having hit the inner one, even though it barely touches it.

8. An arrow rebounding from the target or passing through, within the scoring face, shall count as *one hit* for a value of *five points.*
This rule is based on the fact that the location of hits are deceptive from a distance and that in the long run such arrows will average *five.*
Unless one observes the target with binoculars it is almost impossible to give the true location of an arrow from 100 yards. But from 50 or 40 yards it is comparatively easy.
If this *rule-of-five* is patently at fault due to a faulty target, it is perfectly proper to demand relief and to adopt ground-rules to cover the contingency. However, no archer should shoot at a leaky target in making a practice score for comparison with scores made elsewhere.

9. Where more than one target is used, hits on the wrong target count as *misses*—even though the archer actually hits the target he shoots at.

10. In tournaments or matches where more than one target is used, no archer is permitted to practise on the target to which he is assigned.

11. The arrows of each archer must bear a distinctive crest or mark, to distinguish them from those of other archers.

12. Every arrow leaving the bow shall stand as "shot" unless the archer having shot it can reach it from the shooting-line with his bow. This rule is void if either the bow, string or arrow break during the shooting.

13. Both the number of hits and the score are recorded; but the *score* only counts in determining the reported *score* for the round.

14. The gross *score* for the rounds agreed on shall only be considered in determining the standing of the archers at the end of the tournament or match. (See *Pages* 144, 145 and 147 for exceptions to this rule.)

15. The "Round" in archery constitutes a definite number of arrows, shot from certain specified distances. All shots must be consecutive. No practice shots are allowed after the round has once begun. (This forbids ranging shots between distances.)
However, at tournaments where there has been a break in the program of shooting, archers are customarily allowed to warm up again, but not at their own targets, before competition is resumed.

16. The longer ranges are always shot first.

17. Two rounds, shot one after the other, is termed a "Double Round." They need not be shot on the same day; but must be consecutive rounds.

DECIDING TIES

No satisfactory rule has yet been adopted to decide a tie. So far as we know, no tie has ever existed for an important place although on several occasions places have been decided as the result of a single arrow.

At the 1904 National Tournament, held at the World's Fair in St. Louis, Mr. G. Phillips Bryant won the Championship with a double York of 192-820. Col. Robert Williams, Jr., was only one point behind Bryant with 191-819, and Will H. Thompson was third with 190-816—for what was perhaps the closest finish on record.

There should be some definite method of deciding an eventual

tie, and the sentiment of leading archers favors giving the decision in such an eventuality to the archer having the highest score at the longest range. If this still results in a tie, that at the next longest range, etc., should decide. In the extremely rare eventuality of an identical score the most Golds, Reds, *et cetera,* in order of rank can be considered.

TEAM COMPETITION

In team competitions, unless the match is at a formal tournament, it is customary to limit the number of archers on each side to any desired number. The entire club, however, or as many individuals who so desire, may shoot—with the understanding that the archers turning in the best scores be considered the team.

This custom is followed to encourage sociability and to permit all members of a group the privilege of at least shooting.

At formal competitions, as at the National Tournament, the team is a four-member affair. But any three or lesser number of archers may enter as a team. Their scores, however, must count against the full four scores made by other teams.

AMATEUR AND PROFESSIONAL ARCHERS

Archery as a sport has steadfastly refused to recognise any difference between so-called "Amateurs" and "Professionals." So long as they obey the rules and customs of the game, neither vocation nor sex is considered. Ladies only are allowed to take part in women's events; but so far *any archer* may compete for the Championship of the United States, as one woman competed for the Grand National Championship as related on *Page* 76.

HANDICAP MEETINGS

Various handicap matches are also held. The method of handicapping is left to those sponsoring such events.

The most important handicap affair now held is the handicap tournament held by The Newton Archers, one of the oldest and most distinguished clubs in the United States, near Boston. Their annual program calls for four formal tournaments each year, each of which is to include a handicap American Round for the possession of the Cummings Cup. In these contests each archer

is given a handicap based on the score which he or she made in the previous contest, taking 650 as par. Thus the cup is won at each meet by the Archer who shows the greatest improvement in his or her score, very likely a novice.

Handicapping at best is a bad policy and no system of just-handicaps in any line of sport has ever been devised. A poor archer can never hope to equal the score made by an expert, and no system of handicaps that enables him to equal the points or exceed the standing of the better shot can ever bring real satisfaction. It may encourage the dub to come out, but it also robs the better man, who from hard work and conscientious effort becomes a real leader, of the just fruits of his labor.

But one thing that will bring *real* pride and satisfaction is for an archer to win by a higher score *from some other fellow in his own class!*

To encourage all archers in clubs or associations to come out and do their best, prizes should be awarded each season to top archers in such respectively proficient groups. In the various rounds commonly shot, 100-*point classes* could easily be established.

A suggested idea for a code of rules to govern a series of group classes in the American Round is:

> Prizes for First, Second and Third places shall be awarded in the American Round competitions to archers winning in their respective classes, as follows:
>
> Championship Class .....For highest score.
> 500-point Class .....For scores between 500-599 points
> 400-point Class ..... " " " 400-499 "
> 300-point Class ..... " " " 300-399 "
> Novice Class ..... " " under 300 "
>
> An archer who wins First, Second or Third place in any class shall be ineligible to win that or a lower place in the same class during the remainder of the season.
>
> To eliminate "jockeying" on the part of archers who have worked their scores up to or near the division-point, an archer shall be considered as shooting in that class to which his previous official standing shall have entitled him; and

he shall be entitled to receive a prize in that class although his next match score shall exceed the dividing line by no more than twenty-five points.

It is well to include any handicap match along with a regular event, as the same score for any determined round can be used to figure either standing.

Novelty prizes can also be offered in connection with regular events. A separate prize can be given for "Most Blues," "Most Whites," "Most Petticoats," or for "Most arrows that hit the edge of two colours," etc. This introduces the element of luck into an event and makes it possible for *any one* to win a prize.

SCORING THE HITS

THE 60-YARD LINE

1928 National Tournament

THE LADIES' CLOUT TARGET

CLOUT-SHOOTING

1928 National Tournament

THE TARGET-LINE
Mid-Western Tournament, Chicago, 1928

THE TARGET-LINE
National Tournament, Rome, N. Y., 1925

ARROWS IN THE TARGETS
Rye, N. Y., 1928

SCORING AN END
Rome, N. Y., 1925

PLATE IV. TOURNAMENT PICTURES

CHAPTER XXI

HOW TO CONDUCT A TOURNAMENT

Conducting an archery tournament properly is mainly a matter of organization, preparation and common sense.

Any one of reasonable executive ability should be able to interpret the rules as explained in the previous chapter and carry a meeting to a successful termination. Valuable experience in caring for details can be obtained by attending a well conducted tournament elsewhere.

There are three phases to every meeting: (1) Organizing the affair, (2) the Tournament itself, (3) the Business Meeting and distribution of prizes.

The two important individuals are: (1) The Tournament Manager, and (2) the Field-Captain.

The Tournament Manager, or whatever else he might be called, is the business man who sends out entries, gets publicity, provides prizes, finances and generally runs the affair. He is a most important person, and his job is often a thankless task. He is really responsible for everything.

So far as the tournament itself is concerned the Tournament Manager must see:

(1) That the grounds are properly prepared for the event.
(2) That the field is properly laid out and positions marked.
(3) That a sufficient number of *satisfactory* targets are provided, and that the faces are in suitable condition.
(4) That suitable provision is made to take care of spectators, particularly to keep them off the shooting-field.
(5) That suitable score-cards are provided.
(6) That arrangements for gathering and tabulating the scores are made.
(7) That suitable distribution of the prizes is arranged for.

In reference to item (3), it must be remembered that targets with weak or leaky centers, permitting *throughs* are an abomina-

tion. Such targets should be amply reinforced as suggested on *Page* 151.

The aforementioned are the most important things to keep in mind.

All preliminary preparations should be taken care of the day before and preparations made to start the shooting on time.

Although entries are usually accepted even after the tournament starts the probable number of contestants can be fairly well estimated in advance and a sufficient number of targets provided for the occasion.

A tournament is usually financed by target-fees, and these should be large enough to cover all expenses.

TARGET POSITIONS AND ASSIGNMENTS

At the National Tournament three archers are usually assigned to each target. If there are not sufficient targets four shoot on some.

The targets are placed about ten yards apart—in groups of three. And the targets are numbered A-1, A-2 and A-3; B-1, B-2 and B-3, etc. A wider space is left between groups than between individual targets. This makes it easier for the archer to pick out the target at which he should shoot than if they were in an unbroken line.

The archers are originally assigned to targets by lot, and the first round is shot at the target thus originally assigned.

But after results of the first round have been tabulated the archers are reassigned to targets according to their scores. The first three archers then shoot on A-1, the second three on A-2 . . . and so on.*

For the third and succeeding rounds those who shot on the various targets Number -1 move to Number -2. Those on -2 move to -3. And those on -3 move to -1. This group rotation is kept up throughout the remainder of the tournament, a change being made at the end of every round.

This device brings archers of about equal abilities together after the first round and makes the remainder of the meeting a series of interesting individual contests clear down the line.

* Targets A-1, A-2 and A-3 are normally at the left of the line; but the tournament committee may designate *any* group of targets as the "A" group, to insure the most nearly equal conditions between the leading contenders.

Archers are allowed to practise before the match begins or during recesses—but not on the target to which they have been assigned to shoot.

POLICING THE FIELD

The only satisfactory way to keep spectators, especially small boys, off the field is to rope it off with heavy rope and have police protection. One officer is sufficient, as a rule, mainly for his authority.

Heavy park benches alongside the range give added protection and provide the best seats for spectators under the aforementioned system of target assignments—since the leading archers are usually at the three left-hand targets.

Chairs are often provided behind the shooting-line for the convenience of archers. A second line of chairs, placed farther back, is customarily provided for their friends, wives, etc., inside the field or inclosure.

A score-sheet should be provided for each target. This should be large enough to record the scores of all archers shooting on the target, and preferably should be printed on cardboard. This is usually mounted on a square of beaver-board with thumb-tacks or a large paper-clip. A pencil should be provided with each score-board.

The Tournament itself, or the shooting, is under the direction of the Field-Captain. He acts as referee and has full charge of the field. All close decisions are referred to him and his ruling is final. His rulings can only be overruled by the executive committee. However, there is seldom any need for such appeal.

Good sportsmanship is usually the rule amongst archers. It is customary to interpret rules in a broadminded give-and-take fashion. Archers are supposed to be ladies and gentlemen and one whose conduct is in opposition to good form seldom continues with the game.

CONDUCTING THE SHOOTING

The Field-Captain should blow his whistle about five minutes before the scheduled shooting begins. This gives archers time to complete their practice ends, gather up their arrows and take their appointed stations.

Before the signal to commence shooting is given the Field-Captain should signal "Attention" and give out any special instructions.

The formal methods are followed where there is time. But at minor affairs, where a single day or afternoon is all the time allowed, regular rules may be suspended and archers required to shoot in pairs, or all at once if there is ample shooting room.

The archers who are to shoot in first turn should go to the line at the "attention" signal.

At a long single blast of the Field-Captain's whistle the shooting begins.

When an archer finishes his end he should step back from the lines.

As soon as the last archer has discharged his final arrow, the Field-Captain blows two shorter blasts on his whistle, whereupon all archers advance to the targets to get and score their arrows.

A series of short blasts signifies "recall," and commands all others to return behind the shooting-line, or to pause until some slow archer, who was not through shooting when the advance signal was given, has finished his end.

Archers are allowed a reasonable time to find their arrows, but lost arrows cannot hold up the game. The Field-Captain can order lost arrows abandoned and spare arrows substituted, to prevent unnecessary delay.

When the shooters have again resumed their places the whistle is given to begin again.

If the tournament is interrupted by rain or other contingency, shooting is continued from last shot end. A round once begun is not started again from the beginning.

An archer who is unavoidably late or whose shooting has been delayed by a broken string, or other unavoidable mishap is, at the discretion of the Field-Captain, usually allowed to make up lost ends between rounds if time permits. However, it must be understood that this is a privilege, not a right; and that such permission is governed by the exigencies of the particular case and the unwritten rules of good sportsmanship.

It is customary to preserve silence during all tournament shooting.

THE TARGET-CAPTAIN AND SCORER

The shooters on each target should elect a Target-Captain and a Scorer. The Target-Captain should be the most experienced

archer and his decisions as to hits are respected. Close decisions are usually referred to the Field-Captain.

The Scorer should be very particular in recording the hits. Neatness and clearness in his figures will materially assist in making up the totals.

All score-cards are turned over to a Score-Keeper immediately after the completion of a round. New score-cards are furnished for every round.

The Score-Keeper compiles the totals and lists the archers according to their standing.

To assist in keeping scores straight a disinterested spectator is detailed to go down the line after each end and check all additions. This is usually done with a colored pencil; and speeds up the work of the Score-Keeper as it relieves him of this work.

At large tournaments it is good policy to hire a competent bookkeeper or accountant equipped with an adding-machine to act as Score-Keeper. A competent official in this department will prevent mistakes and insure the management against unpleasant criticism due to errors that may be found later.

THE BUSINESS MEETING AND DISTRIBUTION OF PRIZES

A business meeting usually accompanies a tournament. If this is an important meeting it should be held in the evening and not sandwiched in between morning and afternoon shooting.

If the business meeting follows a tournament, prizes are then given to the winners. Otherwise prizes are usually distributed on the field as soon as the winners can be ascertained.

Where merchandise prizes are given, in addition to the regular cups and medals, they should be displayed with cards identifying their donors. These are usually in the nature of archery tackle that has been sent on as an exhibit. If any of these prizes are donated as rewards for special events they should be so designated. Otherwise it is customary to distribute them according to choice. The Champion gets first pick of the lot, second man next . . . so long as the articles last.

The foregoing are by no means to be considered as complete rules and instructions for running a tournament, but in the nature of reminders of the most important considerations.

LADIES AT TOURNAMENTS

At tournaments where the ladies compete separately, their targets are set up independently, and the shooting is conducted under the direction of the "Lady Paramount," who corresponds to the Field-Captain with the men.

CHAPTER XXII

THE EIGHT ACTS IN CORRECT SHOOTING

Roger Ascham in the immortal *Toxophilus* was the first writer to definitely classify the different divisions in the art of shooting with bows and arrows.

Toxophilus, published in 1545, was the greatest of all books on archery, because it was the first to lay down correct principles of the art in a masterful way, and all subsequent books on the subject have drawn more or less from it.

In the latter half of the nineteenth century Horace Ford took up the subject where Ascham left off, and materially improved the art. A student of archery will do well to read and digest the works of these two writers.

In this book we intend to follow the example of Roger Ascham, or rather to embellish his system.

Ascham divided the act of shooting into "five points."

The present writer divides the art of scientific shooting into eight, which, to distinguish them from Ascham's system, we shall term the "Eight Acts." They are, in order of their proper sequence:

Standing,
Nocking,
* Thinking,
Drawing,
Holding,
* Aiming,
Loosing, and
* Following.

These eight acts comprise the original "five points." To these we had added three additional acts as noted by the asterisk (*).

Although each of the eight merge with those that follow, so

that the entire performance is really one continuous effort, each one is a distinct period and its proper observation and execution is necessary to the success of the shot.

The beginner is urged to study and master the details of each separate act before beginning to think too much of making scores.

Only by continued practice, and of one thing at a time, can correct form be developed. Without correct form good shooting is impossible.

Different archers will, of course, have variations in form and technique peculiarly their own. No two persons are physically and mentally alike. Yet there are some definite principles that apply impersonally.

But regardless of individuals we should return to old Roger again for advice, and heed his wise admonition, that *"good mennes faultes are not to be followed."*

Regardless of apparent ability the student must learn to distinguish between good form and bad, so he can learn what to follow and what to overlook.

APPLICATION TO WOMEN

We have limited our remarks in this volume mainly to the shooting of men, simply because that was the department of archery with which we were personally more familiar. But what we say in regard to men applies practically with the same force to women, since the principles dealing with their shooting are practically the same.

ATTENTION TO DETAILS VERY IMPORTANT

We believe that the great fascination of archery lies in its elusive qualities. In no game that we have knowledge of have so many apparently insignificant factors so great a bearing on the outcome.

Proficiency in archery can never become automatic. The slightest inattention to some minor detail cuts down even a forty-yard end-score tremendously.

On the afternoon of September 16th, 1928, the writer posed for the pictures that portray the different positions-of-shooting shown on *Plate* V, at the home of Dr. Wesley Taylor at Greensboro, North Carolina. Shooting from 40 yards immediately afterwards he made the following score for thirty arrows:

999777	6	-48	
999977	6	-50	
977777	6	-44	18 Golds
999997	6	-52	12 Reds.
999997	6	-52	
		30-246	

This score was made with the forty-two-pound self-yew used a few weeks before at the National Tournament and 390 Grain arrows of Port Orford Cedar with lemonwood footings.

A search of all available records shows that to the time of this writing this score has only been equalled on two occasions and exceeded on two. Paul W. Crouch of Newton Centre, Massachusetts (on July 19, 1925), and S. G. McMeen of Pasadena, California (on August 16, 1918), each made a 30-246. Stanley F. Spencer of San Pedro, California (at an exhibition on September 25, 1927), made seven consecutive ends of, 52, 50, 50, 50, 48, 54. The last six of these totalled 30-252.

The best score of all, however, was made several years ago by Dr. I. V. Cole of Seattle. His ends totalled, 54, 54, 50, 50, 50 for the astounding score of 30-258. To have made this score Dr. Cole must have made 24 Golds.

The principal reason for reporting the aforementioned score, however, is to sustain the contention in a preceding paragraph, —that shooting with the bow-and-arrow does not become automatic. For on the very next afternoon, for some unaccountable reason, the arrows simply would not behave and it was with great difficulty that ends in excess of 6-40 could be obtained. Some little detail was being slighted, and until the reason was properly diagnosed and corrected only mediocre scores were made.

CONSISTENT SHOOTING THE REAL TEST OF A GOOD ARCHER

The principal difference between real archers and those who merely have one or two good days and are never able to "shoot like that again," lies in the ability to size up the situation and ascertain just what *is* wrong. A lucky archer may experience a few lucky ends or even one or two high scores, but the real archer

	CROUCH	PALMER	ROBERTS	LAMBERT	BRUSH	ELMER	JILES
What weight Bow do you use (pounds)?	56-58	52 FORMERLY 44-46 NOW.	48-50	45-48	54	44-50	55
Do you use the same bow at all ranges?	YES	YES	YES	YES	YES	YES	55 FOR YORK 48-50 FOR AMERICAN
What weight Arrows do you use (grains)?	425	434	390	434	434	434	390
How long are your Arrows and How Far do you draw them (inches)?	28 TO POINT	28 TO POINT	28 TO POINT	28 TO POINT	26½ ABOUT 25 IN.	27 TO POINT	27 TO BACK OF PILE.
Do you grip the Bow Tight or Loose?	LOOSE	VERY LOOSE	LOOSE	SEE TEXT PAGE 136	FAIRLY LOOSE	LOOSE	TIGHTLY AT THE LOOSING POINT
Do you stand with Feet Together or Apart?	12 INCHES APART	APART	APART	15 INCHES APART	14 INCHES APART	APART	14 INCHES APART
How do you hold the Bow-Arm?	STIFF	STIFF. "PIVOT" HANDLE BETWEEN THUMB & FOREFINGER. STRAIGHT WRIST	SLIGHTLY BENT SLIGHTLY RELAXED. WRIST LOCKED.	FIRM BUT NOT LOCKED AT ELBOW	RIGIDLY HELD, BUT NOT LOCKED AT ELBOW.	SLIGHTLY BENT. RELAXED	STIFF
What Finger Protection do you use?	SPECIAL ARTICULATED FINGER-TIP HARNESS (SEE PLATE)	HORSEHIDE GLOVE WITH TABS.	KID-GLOVE WITH LEATHER TABS ¾ AROUND FINGERS.	FINGER-TIPS OF SPLIT COW-HIDE (SEE TEXT.)	DRIVING GLOVE WITH NO SEAMS DOWN FINGERS. LEATHER TABS SEWED ON.	LEATHER TIPS OF SHELL HORSEHIDE OR RAZOR STROP LEATHER.	GLOVE WITH STRIPS OF CORDOVAN SEWED ON FINGER-ENDS
Where is your "Anchor-Point"?	BOWSTRING AT ANGLE OF CHIN	TOP OF FINGER TOUCHING UNDER CHIN.	FIRST FINGER BACK KNUCKLE TO ANGLE OF JAW. BACK OF HAND UP.	BOWSTRING AT ANGLE OF CHIN. TOP OF FOREFINGER UP AGAINST IT.	FOREFINGER UNDER TIP OF NOSE AND POINT OF CHIN.	CORNER OR ANGLE OF JAW.	FIRST JOINT OF FINGER TOUCHES CHIN DIRECTLY BELOW EYE
How do you Aim?	LEFT EYE CLOSED	BOTH EYES OPEN.	SQUINTS NON-SIGHTING EYE	CLOSES LEFT EYE TO AIM. OPENS BEFORE LOOSE.	BOTH EYES OPEN.	EITHER BOTH OPEN OR WITH SQUINT	BOTH EYES OPEN
In Aiming is your DIRECT VISION on Point-of-Aim or Target?	ON POINT-OF-AIM.	ON POINT-OF-AIM	ON POINT-OF-AIM AT 80 & 100. OTHERWISE ON TARGET	SHIFTS FROM ONE TO OTHER. (SEE TEXT) PAGE 161.	ON POINT-OF-AIM	ON P-of-A AT LONG RANGE ON TARGET AT SHORT.	ON P-of-A IGNORES THE TARGET.
How do you Aim at 100 Yards?	TIP OF ARROW ON GOLD.	2 OR 3 DIAMETERS ABOVE TARGET NORMALLY. USES RINGS ON ARROWS WITH WEAK BOWS.	3 DIAMETERS ABOVE TARGET. USES RINGS ON ARROWS SOMETIMES WITH WEAK BOWS.	POINT-OF-AIM ABOVE TARGET. SPECIAL SIGHT (SEE TEXT) PAGE 168.	2 TO 3 DIAMETERS ABOVE TARGET. PREFERABLY 3.	P-of-A ON TARGET. REGULAR METHOD	3 DIAMETERS ABOVE THE TARGET
What is the Character of Your Loose?	SLIGHT PLUCK.	FINGERS BROUGHT STRAIGHT BACK. DECIDED PLUCK.	STRAIGHT BACK.	DECIDED PLUCK. HAND DRAWN STRAIGHT BACK.	STRING SLIPS AWAY AFTER STRAIGHT BACK MOVEMENT. ALSO SHOULDER MOVEMENT.	ROTATES BOTTOM OF HAND UP WITH SLIGHT BACK MOVEMENT OF HAND.	SIMILAR TO PLAYING A HARP.

COMPARISON of METHODS of the LEADING ARCHERS
1928 NATIONAL TOURNAMENT, RYE, N.Y.

FIG. 44

of ability is the one who can pull himself out of a slump when the occasion requires.

To avoid complications in the following chapters on the acts of shooting, the present writer intends to follow the policy of describing *his own* methods, not that they are to be considered the last word on the subject, but to give the reader the benefit of examples that have produced first-hand results.

We do not hesitate to admit that we are conscious of a few faults and ideas that still remain to be perfected. There are also some that probably haven't yet come to light. But we believe these are more in the nature of small details, such as are due to personal physique and temperament.

In discussing the different acts herein we lay no claim to originality. We have watched, read, adapted and adopted freely! But we shall try to discuss old topics at least from a different point of view.

Here and there something new or original may creep in. If so—very well!

To give the reader some measure as to how our personal opinions and methods compare with those of others competent to be classed as best-examples, we show in *Figure* 44 a tabulated questionnaire obtained on the ground at the 1928 National Tournament of the N.A.A. This lists for ready comparison the principal matters of technique employed by the first six archers and that of a former Champion.

PRINCIPLES APPLY THE SAME TO WOMEN AS TO MEN

As noted near the beginning of this chapter, the same principles apply to women as to men. The chief difference, however, is that since women use lighter bows they must be *exceedingly careful* with their loose.

All allusions to "right" or "left" assume that the archer holds the bow with his left hand and *draws* with the right. If the individual reverses this usual procedure he is termed "left-handed" as an archer, and all respective references as to hands, feet, etc., should be reversed.

CHAPTER XXIII

STANDING, NOCKING AND THINKING

STANDING

The bow is taken from the rack and grasped firmly by the handle, with the top of the handle about even with the top of the grasping hand.

Let the left-arm drop naturally beside the left-hip.

This leaves the bow in horizontal position with the string uppermost—1, *Plate* V.

From now until the last arrow of the end is released the grip is never changed, except to relax the forefinger a bit, to steady the arrows as they are put in place while nocking.

The archer takes his position straddling the shooting-line.

The six arrows to be shot are taken from the service-quiver or pocket and placed in proper order in the ground-quiver. Each arrow should be numbered for identification and ought to be shot in its regular turn.

In standing, the archer should face at right-angles to the target when he takes position. The feet should be placed from fifteen to twenty inches apart, making an angle of from forty-five to sixty degrees with each other.

The heels should be in line with the target, as shown in *Figure* 45.

A "posing archer" often shoots with his heels together; but a slight wind will upset him and spoil his equilibrium.

The feet should be well planted; for if the footing is firm and comfortable better shooting will result. Unless some good reason justifies it, an archer should not move from his tracks after once taking his stand. It is for this reason that the ground-quiver should be used. It both marks his standing-position, so the shooter can later return to the identical spot, and hold his arrows upright, in easy reach. Moving about between shots is unnecessary.

The weight of the body should rest evenly on each foot.

During the entire acts of shooting the leg muscles must be drawn tight, but in no case to the point of stiffness. In fact, at no time should the muscles lack elasticity of position. There is nothing jerky about shooting. Locked joints and taut muscles must be avoided. At the same time flabbiness of set or position is likewise wrong.

The knees should be drawn back until the proper rigidity is attained, but in no case locked.

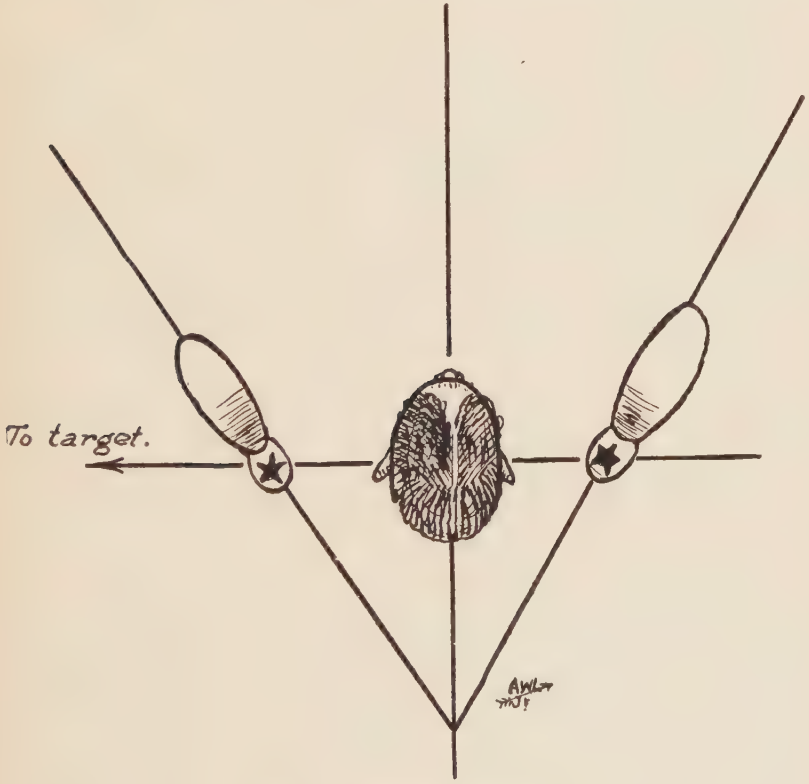


FIG. 45. STANDING POSITION

During the draw care should be taken to keep the weight still evenly distributed down each leg and on each foot. The archer should not lunge forward as if to meet the target. Nor should he lean or bend his body backward, as if trying to get as far as possible from the bow.

Once the standing position has been assumed no change to any perceptible degree should be made with legs or torso.

The shoulders hold their original position, directly above the heels, as shown by the "stars" in *Figure* 45.

During the acts of drawing, holding, aiming and loosing which follow, only the head is turned, the work being done with the arms in such a way as not to disturb the original position taken when going to the shooting-line.

To properly discharge an arrow is apparently an effortless procedure. Any straining, twisting, swaying or lunging on the part of the archer indicates improper form in some respect.

GOOD SHOOTING A GRACEFUL PERFORMANCE

Shooting that is properly done is a graceful performance, otherwise sculptors and painters would never have sought inspiration from the bow-and-arrow for some of the famous works of art that are supposed to embody the spirit of gracefulness in their exposition.

But the beginner is warned not to ape "gracefulness" or "artistic qualities" in his shooting.

Shooting to hit the mark with regularity is a business-like procedure, not a Delsartian gesture.

The place for conscious striving after artistic effect should be relegated to those modern versions of Greek plays in which sweet young damsels cavort around in flimsy nighties, with scroll-saw bows and india-rubber "bowstrings." The Bow-and-Arrow Dance of Mordkin may delight an untutored audience before the footlights, but such classic postures would never go on a target-range where the *Gold* was from forty to one hundred yards away.

The ambitious archer is warned against any undue affectation in the name of "form." Good form is simply a balancing of the forces that are brought into play, with the attendant proper distribution of weight, effort and position of the respective body members.

As with the appearance to the eye of a good bow, the expert archer will attract the eye of a spectator by his apparent lack of effort, rather than through exaggeration of any single act in the entire performance.

1. STANDING

2. NOCKING

3. THINKING

4. DRAWING

5. HOLDING AND AIMING

6. LOOSING AND FOLLOWING

7. STRINGING THE BOW

8. AIMING

9. GETTING SET

PLATE V

THE EIGHT ACTS IN SHOOTING, ETC.

NOCKING

The act of **nocking** is so simple that it is hardly necessary to look at the arrow while performing it, yet nocking an arrow is one of the clumsiest things a beginner can do.

When you first take up shooting, practice nocking until the act is natural and easy to do. Ten minutes' trial should enable you to master this act.

The arrow should be taken from the quiver and placed across the bow at the **arrow-plate**. Hold the bow horizontally while doing this.

Steady the arrow and hold it against the bow with the extended forefinger of the left hand—2, *Plate* V.

Carry the right hand to the nock end of the shaft and hold the arrow there between the thumb and forefinger of the right hand.

Twirl the shaft between these fingers until the **cock-feather** is at right-angles to the side of the bow.

The cock-feather, which must stand out from the bow, to avoid being scraped off when the shaft is released, is usually of a different colour from the other two vanes. Often the trade-mark of the maker or other identifying marks are provided to guide the archer in nocking. But, even in the absence of all such designations, only a raw beginner would put the arrow on wrong.

There are only two ways of putting the arrow on the string. One is right, the other wrong! The difference between them is self-evident.

Remember! the arrow is placed on the **left** side of the bow for right-handed archers. The draw commonly used by modern archers requires pulling back the string with the first three fingers of the right, or drawing, hand. If you have shot with the weak bows common to boyhood and have drawn an arrow with the simple **pinch-grip**, you have in all probability placed the arrow on the right of the bow, and for a while the new method will be awkward. Therefore, a beginner should practice shooting to begin with without regard to any aim or idea of hitting a target—until it is easy and natural to shoot with the proper draw and with the arrow on the left side.

While putting the nock on the string, slip the end of the shaft below the bowstring and hold it between the thumb and first finger

—with the bowstring passing through the circle formed by them. If this is done the shaft can be twirled easily and the nock fitted at the exact nocking-point with a minimum of awkwardness.

When the arrow is on the string the shaft should be exactly at right-angles to it. For best results the **nocking-point** should be exactly located and served as explained on *Page* 91.

Under no circumstance should the nock be forced onto a large string! Splitting will result! And an arrow so damaged is likely to slip off the string at the moment of loosing. This is apt to cause a broken bowstring and often a broken bow.

After the nock has been properly fitted to the bowstring, tighten the pressure holding it and draw the shaft back an inch or two. The forefinger of the bow-hand should then be clamped around the shaft, at the arrow-plate, and the bow-and-arrow both held in this sort of half-cocked condition while the drawing-hand is removed entirely.

The right, or drawing-hand, is now completely free. The finger-tips can be "adjusted" by rubbing the fingers down the thigh until the feel is right.

The bow is still in a horizontal position, practically as shown in picture—2, *Plate* V. Only there is now an arrow on the string, ready to be drawn and shot—just as an expectant hunter would have his bow *loaded* to prevent loss of time in shooting should his quarry suddenly appear.

When ready to begin the draw, carefully fit the three drawing-fingers to position, as shown in 2, *Plate* V. Then take the strain off the slightly drawn bowstring onto the three drawing-fingers, holding the arrow in position between the first and second. The left forefinger, which has been used hitherto to steady the arrow and hold it in place for the time being, is withdrawn and replaced around the handle of the bow. In so transferring this holding-strain great care must be taken to release the pressure of the forefinger in time to prevent pulling the string away from the arrow. A close-up picture of the bow-and-arrow with the draw ready to begin is shown in 9, *Plate* IV. Notice that a tight grip is not necessary to hold the bow!

DRAW BACK THE STRING, NOT THE ARROW

In drawing, the rear of the shaft is somewhat pinched between the first and second fingers so it will be drawn back when the string

is pulled. We do not draw back *the arrow!* With the English, or three-fingered draw, the string is drawn back! The arrow merely comes with it.

In fitting the three drawing-fingers to the bowstring take care to let the string cross at about the middle of the first phalanges. If it is held too near the ends, to obtain a supposedly easier release, too much strain is thrown on the finger-ends and physical breakdown is likely to result. If hooked in the crease between the joints a stronger drawing power is obtained—but it is impossible to let go of the string in anything like a satisfactory manner.

Some archers sew string-stoppers to the finger-tips to "prevent"

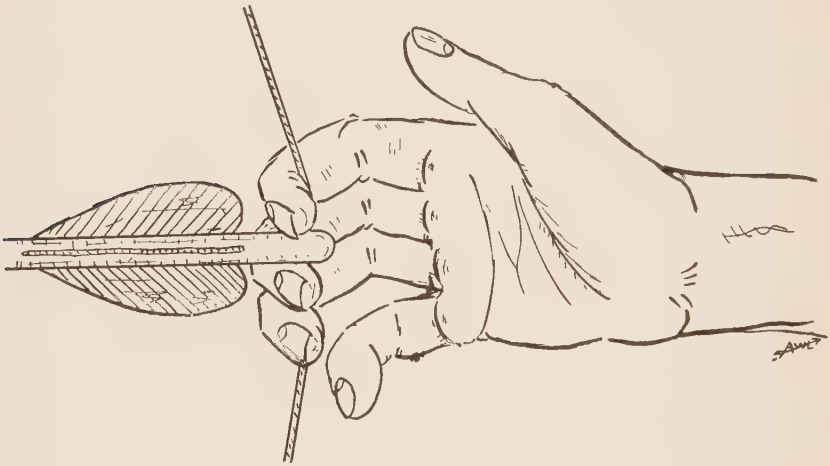


FIG. 46. THREE-FINGERED DRAW
At Beginning of Draw.

the string from slipping back too far, as shown in *Figure* 55. It is supposed to be an aid to good and unvarying looses. Some good archers use them, but the writer finds them worse than useless. This is because of his peculiar style of draw and release.

To begin the draw we start with the string well back, just in front of the crease between the first two phalanges, with the ends of the fingers hooked considerably, as shown in *Figure* 46.

Then, as the bowstring is drawn back past the position of about half-draw, 4, *Plate* V, we *straighten out the fingers* and let the bowstring roll slightly toward their ends.

This causes a little mound of flesh on each finger-pad to rise ahead of the bowstring, and lets the fingers act much in the manner

of crochet-hooks. This stage of the draw is shown in *Figure* 47.

This method of draw is very strong and is easy on the fingers. The bowstring is securely held, yet a little **flick**!—and the arrow is on its way for a clean, lively flight. This little trick also brings the two fingers adjacent to the nock around in a manner that greatly helps keep the arrow against the side of the bow.

After the drawing-fingers have been fitted to the string in the proper manner, and the forefinger of the bow-hand has been re-

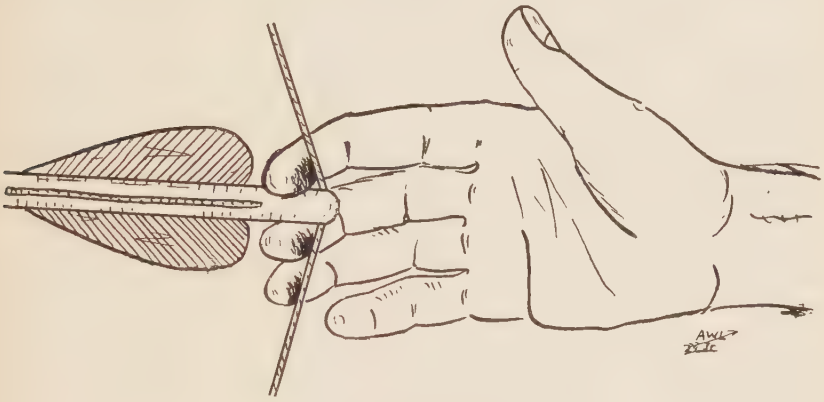


FIG. 47. THREE-FINGERED DRAW
Ready to Loose.

gripped about the handle, the bow is raised slightly and the arrow drawn back about six inches. This brings us into the position shown in 3, *Plate* V.

The next act is ready to be performed.

THINKING

It is here that a great many archers fall down. Successful shooting requires thought and planning with each shot.

Now is the time to actually plan the shot!

Ascertain the number of the arrow!

Recall to mind its own peculiarities!

Then look to spot the object that you wish to use for your **point-of-aim.**

Allow for the vagaries of the shaft. Take in mind the wind and other external influences.

Decide what you are going to do, and make up your mind to do it properly.

In turning the head to view the target, don't move the body or shoulders, and remember to keep the weight evenly distributed on both feet.

The head is turned to about the right position when the target can be plainly seen over the tip of the nose with the left-eye closed.

When everything is set, both mentally and physically,—continue with the act of *Drawing*.

CHAPTER XXIV

DRAWING

When the archer has finished **Thinking** and has made up his mind just what he is to do and how he intends to do it, the bow is brought up smartly to the shooting-position and the arrow drawn.

The two arms should exert about the same effort—the bow-hand going forward about the same distance the drawing-arm draws back. Both hands should arrive at the position for *Holding* at about the same instant.

As will be further explained in the chapter on **Aiming**, the writer advocates drawing immediately to the **full-draw** position, as shown in 5, *Plate* V.

The preceding picture, 4, shows the half-draw position; however, this picture was taken during motion. No actual pause was contemplated here as the photograph seemingly indicates!

MEANING OF THE TERM "FULL-DRAW"

The term "full-draw" is used in conflicting ways. For bow-testing purposes it refers to drawing the arrow of proper length for the bow, to the end of the pile. But in the forthcoming discussions of shooting-technique it refers to the archer's *position of full-draw!* This may be shorter, by an inch or so, than the safe length the bow itself will stand.

In any event the archer should remember the old maxim:

"A bow fully drawn is seven-eighths broken!"

Overdrawing of the arrow itself is extremely dangerous. An arrow drawn **inside the bow** and loosed is splintered. It is better to use arrows an inch too long than arrows that are too short, to avoid such a catastrophe.

Many shooters draw to an estimated "proper length" by feel. Or at least think they do! The exceptional archer, after long practice, may acquire a superior sense of drawing-feel; but the beginner, or even the average archer of many years' standing had better rely on a more accurate means of measurement.

The writer can shoot fairly well by feel—to the extent of hitting practically every time at sixty yards; but for consistent high-scoring over a long period of months he has never found a substitute for the visible check afforded in drawing exactly to the base of the pile.

Some archers draw the arrow—leaving from an inch to an inch and a half of the shaft undrawn. Then—after getting the point of the arrow on the point-of-aim, complete the act of *Aiming*—finish the draw, and loose!

Though many excellent archers shoot in this fashion to greater or less extent, we believe it to be a bad habit! At times it works to perfection, sending the shafts straight to the target with remarkable regularity; but too frequently the knack is lost and flights seem to persist, in spite of everything, in going wrong. This method really puts the act of *Thinking* somewhat at the wrong place, particularly if the shooter has to search to locate his point-of-aim and plan the further execution of his shot.

Overdrawing—in the sense of drawing the arrow back beyond the point of full-draw (when longer arrows are used), is a very bad fault. Some archers are seen to draw even an inch in excess of their required length, then slack up the draw, and aim. This practice is fatiguing to the bow. It also calls for a certain amount of relaxation to straining muscles which is apt to destroy control to an appreciable amount.

The writer draws immediately to the exact position of full-draw—then literally *"freezes"* in this position and attitude. It takes less effort to do this with a single movement and hold, than to break the continuity of effort.

An archer is under considerable physical strain at the near full-draw position. To pause here, preparatory to pulling up the additional inch or so later, after aiming, before letting go—means that the muscles and arms are brought to rest in a sort of "broken arch" position. The original momentum of the draw is lost, and movement to complete the draw must be begun from rest again. This involves additional mental as well as physical work, and results in lost effort.

DRAWING ANTICS

A spectator has only to observe a number of archers in action to see that there are many and devious ways of drawing.

Some archers appear to go through a semi-religious ceremony in

performing this act. One extends the bow-arm, then draws his arrow back. Another holds the drawing-hand back, then pushes his bow forward. Some draw about three-fourths of the way, pause, oscillate the arms a bit, then continue. Some draw the arrow nearly to the head, drawing low, then raise the bow-hand once or twice before settling down to aim.

But drawing the bowstring is no exception to the general rule—that the best performers seem to do things in the easiest manner. Any useless or awkward motions result in lost energy.

Drawing the bow is analogous to putting in the charge of powder. It is the act that stores the energy that later speeds the shaft on its way. And as powder charges are most carefully measured, to secure uniformity of result, the greatest care must be taken to see that the same length of arrow and timing of the draw is observed each time when shooting with the bow-and-arrow.

The pile itself, as we remarked before, is the most convenient object to visibly check the length of draw. Full-length arrows should be cut off and the pile set back if the owner draws a lesser length, otherwise drawing rings can be painted on the shaft to indicate the proper position.

Individual archers employ different methods of gripping the bow. A study of the questionnaire, *Figure* 44, reveals some divergence of opinion amongst the leading archers of the country. There is also a difference in opinion as to whether the bow-arm should be locked or loose. However, we have closely watched the archers quoted in action and notice no real rigidity at the elbow-joint even of those advocating the "lock," so feel that by the term "locked" they meant that the muscles were tightened perceptibly, rather than an actual locking of the bones.

Our own particular method of shooting favours the following ideas, as to conditions at the time of full-draw:

Grasp the bow with the left hand. The left wrist should be bent back slightly, away from the palm. This brings the fulcrum of the handle against the fleshy pad at the base of the thumb. It also allows the left forearm to project back at a slight angle, to give the bowstring clearance.

We prefer to hold the arm rigid, but with a slight bend at the elbow. Not locked in the same sense that the toggle-joint locks! We firmly insist on sufficient resiliency there to take up any jar or recoil!

The wrist must not be bent towards the palm, as this will weaken the grip.

The left shoulder is slightly hunched, to provide a solid base against which the pressure of the drawing-arm is directed.

Except that the muscles are somewhat stiffer, we are simply doing the natural motions and assuming the position that would be assumed if we were demonstrating the correct method of drawing without a bow-and-arrow actually in hand.

Under no circumstance try to draw too much arrow, or your forearm will extend too straight for clearance, and the bowstring will strike the wrist.

Many archers grasp the bow very lightly, and some let the thumb project up, along the bow. We prefer to grip the handle with a firm vise-like grasp that uses the ends of the fingers to press the handle back firmly against the base of the thumb. This is in contradistinction to any tight squeeze-grip, as if the handle were a lemon.

The bow is held very much as if it were a hammer.

HANDING

The writer has a way of handing the bow during the discharge of an arrow. This is similar to the wrist-work in hitting with a tennis racquet. It is a correlation between bow and bow-hand that is difficult to describe, and almost impossible to observe. It cannot be done if the bow is held too tightly. When we do this properly we get Golds and Reds, one after another, from all distances, otherwise hits in the outer rings are frequent.

By properly controlling this reaction of bow to bow-hand at the moment of release, flights of arrows can be materially controlled. Arrows that normally give divergent groups can be brought into remarkably close flights, particularly can wide-flyers be brought to fly straighter. A delicate sense of feel, and a degree of involuntary adaptation to the *handing* necessary for each individual arrow, does produce better results.

It is most essential to watch the position of the bow-hand, to see that the same point of resistance is against the same part of the handle for each shot. We must not resist the pressure of the *fulcrum* at the bow-handle against what palmists call the "Mount of Venus," at the base of the thumb, one time, and against the

"Mount of the Moon," at the lower part of the base of the palm, the next.

A close examination of the pictures of Wm. H. Palmer, Jr., present National Champion, illustrates in a measure the very loose grip he uses. The bow-hand is actually tilted forward and his bow held practically by pressure against the junction between thumb and forefinger—not against the fleshy pad lower down. This allows exact similarity of reaction between the bow and the hand with succeeding shots. This is a practicable method for use with weaker bows, such as Palmer used at the last tournament; but for stronger bows or for shooting over extended periods this practice is apt to be fatiguing.

Dr. Roberts holds his bow very loose. Instead of actually gripping the handle, he prefers to "lean against it" with the palm of the bow-hand.

A close examination of the grips used by leading archers, as shown in the various photographs, should be closely studied, both to study the points of resistance between hand and bow, and to note the relative degrees of squeeze, or tightness of the grip itself.

FREAK GRIPS

The use of freak grips is universally condemned by leading archers. In no instance is such a monstrosity to be observed in the pictures in this volume, nor have we ever seen one in use by an archer of recognised ability.

Beginners with inventive proclivities often cover the handle with plastic material that can be moulded to fit the fingers. Others fit huge lumps of wood and carve grooves to fit each finger.

This is good theory, but another instance of poor fact. If the shooter's palm is unduly hollow, a slight projecting bulge in the rear is permissible. The handle should be well rounded for comfort. But any undue artificial handle-shaping should be regarded with suspicion, unless necessary to correct some unnatural condition that prevents the archer from taking a normal grip.

A good archer frequently gets in a slump, and, to get out of it, it is necessary to change his method of shooting slightly. Drastic action is often necessary to overcome the almost inevitable slump experienced in a long, close tournament. The strain is psycho-

logical as well as physical. Often a slight change in the method of gripping is made with profit, and if the bow be fitted with a fixed-grip of fantastic design, this cannot be done.

In apparent contradiction to the above contention let us relate a personal experience at the 1927 National Tournament, at Cambridge.

The writer had a miserable day at the first 100 yards. Everything seemed to go wrong; and when the names of the ten leaders were posted that night—our name was nowhere on the list.

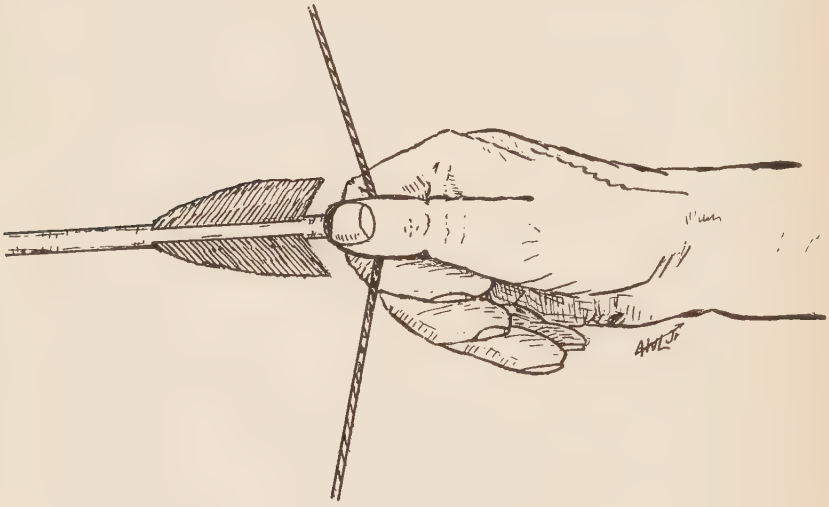


FIG. 48. THE PRIMARY DRAW

When shooting was resumed the following day the jinx was still on the job. We finally *blamed the grip*—and fixed a spongy-rubber pad to the handle with adhesive tape.

At the end of the second York Round we had moved into second place, and finished in third, but two points behind A. L. Brush, who finally won second honours.

After the tournament *this pad was removed* as undesirable!

We mention this incident for what it is worth! To show that archery is a matter of psychology as well as physique. In reviewing the event we certainly do not give the handle-pad direct credit for the improvement, but it did help in some mysterious way to get us back to normal.

VARIOUS DRAWS, OR RELEASES

Several different methods of drawing the string are generally known. The **release** from these draws is commonly termed the "loose."

Prof. Edward S. Morse first made a study of the releases of various peoples and published a paper on the subject in 1885. He was the first to classify the different methods.

The most common draw, or that usually employed the world over by children, is termed the **Primary Draw**, as shown in *Figure* 48, in which the arrow is drawn back by a pinch-grip between thumb and forefinger. For weak bows it served very well; but when peoples used stronger weapons this draw proved inadequate. The shaft would slip away before it could be fully drawn.

To facilitate the **Primary Draw** arrows were often made with bulging nocks, as shown in *Figure* 49.

FIG. 49. ARROW WITH BULBOUS NOCK

But with still stronger bows and longer arrows this proved inadequate, so the tips of other fingers were fitted to the string, as shown in *Figure* 50.

Oriental archers, however, employed the "**Mongolian" Draw** as pictured in *Figure* 51. With this draw a drawing-ring, often of elaborate and costly workmanship, was necessary.

The Mongolian, or Asiatic, draw is commonly associated with peoples who used the composite bow. In its execution the string was drawn back by the thumb, which was sharply bent over it. The forefinger was bent over the tip of the thumb, to aid in holding it. The arrow was held at the junction of the forefinger and thumb.

In these aforementioned draws the arrow was commonly placed on the *right side of the bow.*

THE SIOUX DRAW

A curious draw, which escaped the attention of Prof. Morse, is known as the "Sioux Draw." It is pictured in *Figure* 52. It is similar to the three-fingered or "Mediterranean Draw" now universally employed. In this draw the four fingers of the drawing-hand are used. The arrow, however, rests on *top of the first finger.*

The thumb is used only to steady and hold the shaft, and the arrow is placed on the *left side* of the bow.

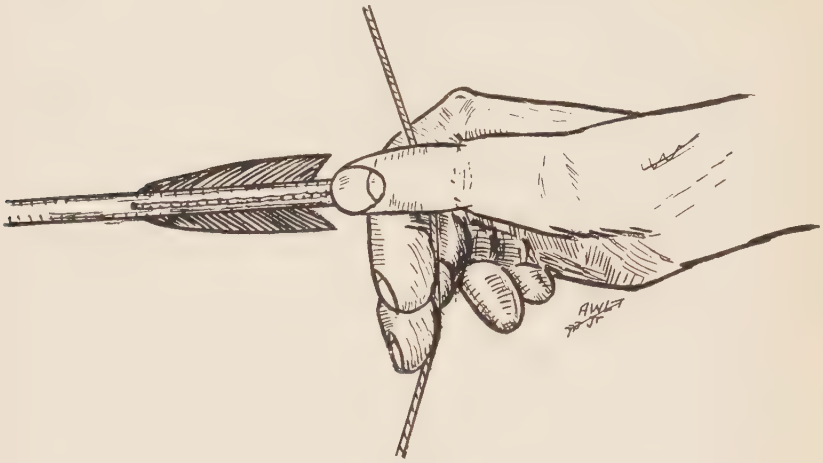


FIG. 50. THE SECONDARY OR ASSISTED PINCH-DRAW

This draw was brought to light by W. J. Compton, who was adopted by the Sioux when a young lad and lived amongst them

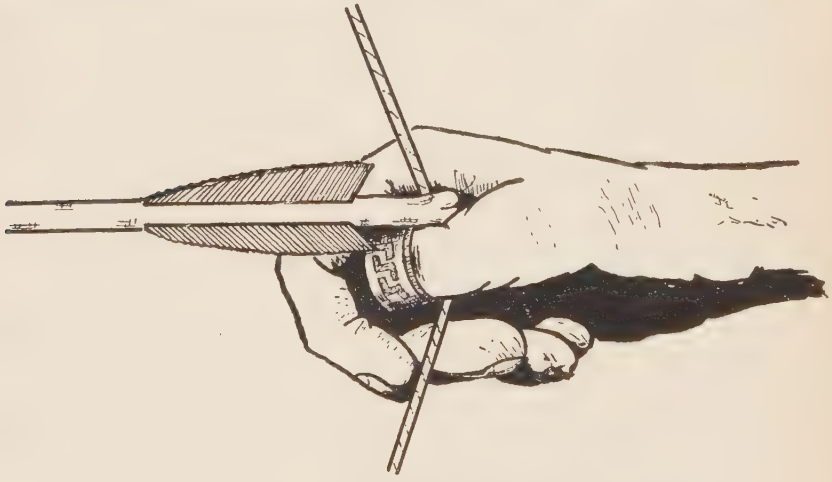


FIG. 51. THE MONGOLIAN DRAW

for fifty years. Compton taught this method of drawing to Arthur Young, the big-game hunter.

For target-shooting the Sioux Draw is not recommended. But

for hunting it has several advantages. Since all four fingers are used, a very strong draw is obtained, necessary to shooting a powerful weapon. As all four fingers are below the arrow there is no pinching by the string as the arrow is drawn back, which is often painful. And it is also quick and easy to place the arrow on the string or take it off without looking at the arrow. In hunting this is a great advantage, since the hunter can look at his quarry while taking a shaft from his quiver to put on the string.

THE THREE-FINGERED DRAW

The three-fingered, or English draw—but which Prof. Morse terms the "Mediterranean," is probably the most effective draw of all. It is used almost universally by archers as we know them

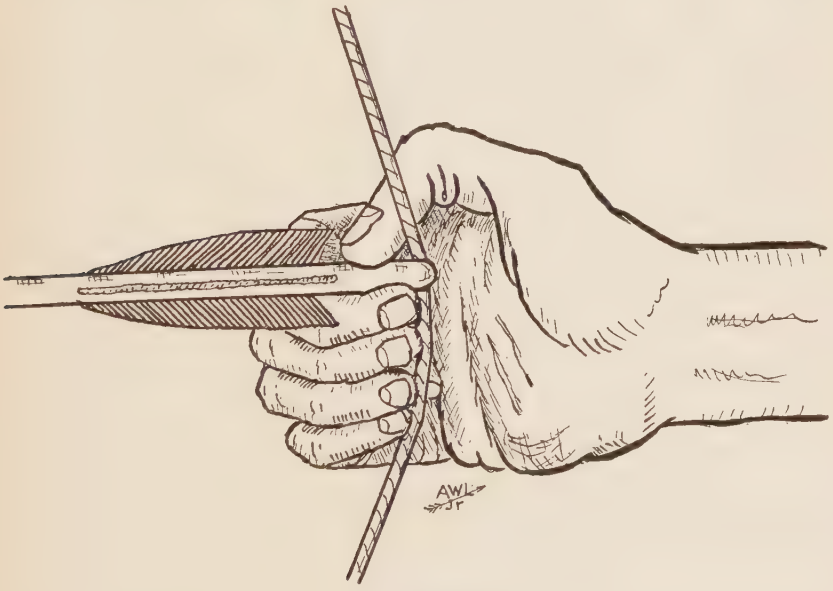


FIG. 52. THE SIOUX DRAW

to-day. It is the most powerful of all, yet withal the loose is clean and easy. This draw is shown in *Figures* 46 and 47, and the various photographs.

The thumb and little finger are not used at all, and should be kept well out of the way.

This draw is sometimes varied to become a two- or a four-

fingered draw. However, either of these is wrong unless some physical deformity or abnormality requires a departure from the standard three-fingered method.

The last scene in the act of Drawing is to locate the final position of the drawing-hand.

The right-hand should always be drawn back to the same place. The olden archer was taught to draw back to his ear. But we do differently to-day!

A discussion of the anchor-point, as this phase is called, comes more properly under the head of Holding or Aiming. So we will pass on, saying that the arrow is brought to rest with the drawing-hand somewhere beneath the chin.

CHAPTER XXV

HOLDING AND AIMING

Although Holding and Aiming are two distinct acts, they are so intimately associated that both should be considered as simultaneous procedures.

In aiming an arrow we proceed exactly as if it were a gun with no sights. We treat it as if it were going to discharge a bullet rather than do the flying itself.

The expert archer aims his arrow just as carefully as the rifleman aims his gun, and hits result largely from proper aiming. **They are in no sense dependent primarily on luck or intuition.**

It is strange, but nevertheless a fact, that the archers of history shot largely by intuition, and that the principles of accurate shooting were discovered long after the bow-and-arrow had been discarded as an important weapon.

In the old days an archer was admonished to "draw to the ear." This gave him a fairly reliable method of measuring the effort to put behind each shot. But, even so, he shot largely by estimation, intuition and guesswork.

We mentioned, on *Page* 10, that in former days of continental conflict armies faced each other largely in massed formations, extending principally in length, parallel to each other. Proper "Length," or range, was the paramount factor, and the exact direction of the arrow was left largely to chance.

In target-shooting a comparatively small area at the centre of the target is the object of attack. This, as well as the surrounding rings of lesser value, can be missed in two dimensions. The arrow can go either to one side, or high or low. It is necessary to direct the flight as well as limit the proper distance.

Hits on another target do not count.

Carelessness in this regard cost the writer over forty points at the 1927 National Tournament, any one of these five or six arrows that were shot by mistake at the wrong mark, which hit the target actually aimed at, cost him second place.

The old English archer used a long arrow, which he drew to the pile. It was natural to draw a long shaft to the side of his face, and, since the ear gave him a convenient and easily felt point to draw to—he was taught to use it. This at least enabled him to draw the nock to the same point each time and made estimation of length for different ranges fairly reliable.

When archery became a pastime and target-shooting took the place of military work, English archers continued to consider drawing to the ear as proper form. And no archer had the temerity to question its effectiveness until the advent of Horace Ford.

Ford probably "horrified" the stolid archers of his day by doing an old thing in a new way. He insisted on drawing to a point below the chin.

He did this to bring the entire length of arrow below the aiming-eye and in the same vertical plane with the point aimed at.

Ford had learned that a properly constructed and loosed arrow flies straight towards the mark at which it is aimed—in spite of the fact that the arrow crosses one side of the bow in a manner that would be expected to deflect it sharply to the left.

Figure 53 shows an arrow at rest in two positions. At (**A**) the arrow is fully drawn and is in aiming-position. The dotted line points to the point aimed at,—the Gold itself if the archer is shooting from the point-blank distance. The line *ab* is the line of sight.

At (**B**) the arrow is shown in the position it would point were the string slowly let down until it came to rest—but with the position of the bow and archer otherwise the same.

The line from the archer's eye to the point aimed at would remain as before, but now the arrow would actually point decidedly to the left, as shown by the line *cd*.

To obviate this supposed tendency to shoot off to the left many inventive "geniuses" suggest boring a hole through the handle of the bow and shooting the arrow through its middle.

THE ARCHER'S PARADOX

Such an "improvement," however, is entirely unnecessary, since the arrow, if properly made and properly released, goes precisely where it is aimed, along the line *ab*—not to the left as would be

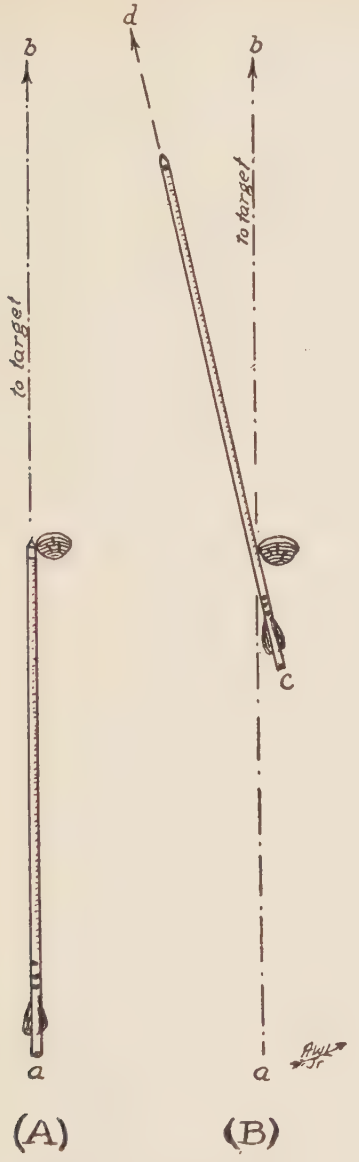


FIG. 53. PASSAGE OF ARROW ACROSS THE BOW
(A) Position at Full-Draw.
(B) Position with draw slowly relaxed.

supposed. This phenomenon is known as the **Archer's Paradox.**

Any tendency to shoot off to the left is either the fault of the archer or is due to the arrows.

A weak and supple arrow will shoot dangerously to the left. An arrow that is stiff and unyielding in the last few inches will also be forced to the left, but not to such a degree as the weak one. But with a certain degree of stiffness, not so great as that which causes left flights, the arrow will actually fly slightly to the *right.*

If it were possible to construct a bow capable of being shot *through* a hole in the handle, perfectly stiff arrows could be shot and they would fly straight. But other difficulties would appear to make for a net loss in efficiency. The most serious consequences would be experienced, for instance, if the loose were the slightest bit faulty. The arrow would be promptly slivered if it caught in the hole, to say nothing of what would happen to the bow or the archer.

Ford discusses the **Archer's Paradox** at length in his book, and Dr. Elmer goes more fully into its explanation in his more recent work. The Phenomenon has not yet been satisfactorily explained, though.

The writer attributes the effect largely to a combination of forces that are well understood by physicists.

Newton's first law of motion states that "all bodies moving in a straight line continue to move in that line unless acted upon by some external force."

If the arrow be stiff enough to resist excessive buckling, that portion in front of the balancing-point is fairly well on its way toward the mark before any appreciable side movement is brought into play. That portion of the arrow therefore gets by the bow—and its initial momentum tends to keep it going in the original direction, or that in which it was pointed.

The rear portion of the shaft, being elastic, or resilient, simply bends until it is free of the nock, then follows the front part of the shaft.

SPINE

The combined quality of stiffness with resiliency is known as **spine,** and, as we pointed out in previous chapters on arrows, it is the most important consideration in the shaft.

Elmer attributes the Archer's Paradox largely to an actual pushing aside of the bow, and accordingly advocates a very loose grip to facilitate this action.

The writer is not satisfied with this as a major factor in the explanation. Frequent trials at shooting in this manner failed to give the accuracy that the loose grip alone would have afforded. That the bow does move a trifle sideways is a fact, but to what extent the side thrust of a very light arrow, passing at a very small angle, affects it, compared with the natural *give* of the bow-hand when the back pressure against it is suddenly removed, we are not prepared to state. Whatever movement there might be we do not believe sufficient to entirely compensate for the paradox.

Just before the nock leaves the string considerable force is exerted against the last six inches of shaft. This tends to bend or "bow" the shaft around the arrow-plate—because as the rear end bends, the centre of mass of the larger portion of shaft that is already in front of the bow still tends to go forward towards the target in the original line-of-sight. And if, as we advocate, this rear portion is weakened, to permit bending, it allows the tail-end to follow, so to speak, smoothly around the bow.

On the other hand, if this rear few inches is stiff and unyielding, it resists the bending spoken of—and, until the nock is completely disengaged, exerts a short lever-like action that brings the front portion of the shaft over to the left—in spite of its original tendency to keep straight.

This contention seems to be borne out by some investigations conducted by Mr. Thaddeus Merriman of New York, whose experiments with the Assyrian type of angular bow were noted on *Page 6.*

Mr. Merriman found that the nock end of the arrow does not touch the bow as it passes, but is often one-quarter of an inch away.

If this is so, it indicates that such a bending at the rear of the shaft does take place—and that on being disengaged from the nock there is a sudden spring to the left that carries the rear extremity of the shaft clear away from the bow.

Where such contact between bow-and-arrow actually ends we do not know. But we believe it to be very close to the rear, since we have repeatedly ruined the front portion of the cock-feather by

shooting with it against the bow. In fact, we tore the cock-feather off several arrows last fall when we reversed the arrow to see what difference such reversal would make. In this respect we might say that an arrow that hit to the right and slightly high often went low and to the left when shot in reversed position.

The Archer's Paradox and many other details related to the strains and stresses and ballistic qualities of bow and arrows form subjects for much interesting scientific research with modern instruments and methods.

But a beginner, despite magic qualities of the Archer's Paradox, invariably persists in shooting to the *left*. This is due to his natural tendency to draw the arrow alongside the cheek—instead of directly under the aiming-eye.

A faulty loose, particularly one that tends to jerk the bowstring to the right at the moment of releasing, aggravates this natural tendency.

We can only say here that any deviation in the flight of an arrow is caused either by faulty material or faulty technique in handling good equipment. Practice and experiment on the part of the individual is necessary to overcome this fault.

ANCHOR-POINT

There is no back-sight on the arrow and it is easy to get in the habit of drawing to a slightly different location each time. Every archer should therefore train himself to draw to some definite point that he can check by sense of touch or feel. This is termed the **Anchor-Point** of the Draw.

One archer will draw until he feels the thumb joint rest against a certain tooth. Another will stick his thumb up and draw till it touches his jaw at a certain spot. Each will have some favourite location. The writer brings the side of the first finger against the jawbone until the string touches against his chin.

Many archers **draw high**—touching the first-finger against a tooth or corner of the mouth. This is a very effective anchor-point for distances less than sixty yards. But it is a decided disadvantage to archers who wish to shoot at longer distances, as it boosts the point-of-aim so high that at eighty and particularly 100 yards there is nothing in view to sight at.

To obviate the necessity for a point-of-aim "in the clouds" some

archers draw low. The most famous of these celebrities is Homer Taylor, whose picture appears on the *frontispiece.*

Instead of drawing below the chin, these archers draw to some point on the breast—often affixing a button to the coat or vest at the "proper location."

This practice is another theory that does not work to satisfaction, and unless the choice falls between shooting in this manner or not at all, its employment is not recommended. The advantage of lower point-of-aim is thus obtained; but other faults, apparently insignificant but really important, creep in to more than spoil any advantage gained.

The act of Aiming is, after all, but one consideration. And, as we will come to later, can be overdone!

To simplify this act the archer should draw the same length of arrow and draw the nock to the same **anchor-point**—at all ranges. We shoot just as hard at forty as at 100 yards. The only difference to note being that incident to the necessary elevation of the shaft. We simply aim higher and higher the farther back we go, but always put the same effort behind every shot. Nor do we change to a weaker bow for the shorter rounds. An archer should use the same bow for all distances. The only exceptions to this rule that we ever follow is at clout-shooting at ranges beyond the power of our customary target-bow, or at indoor shoots at short ranges, where a bow of less weight is advisable. Neither of these events, though, can be considered as belonging to the regular target programme.

With the draw completed, the shaft is aimed. This is not an instantaneous procedure. It takes time, and during this time the archer performs the important act of **Holding**. He must **hold** until the act of Aiming is complete. Then comes the act of **Loosing**—which, as we shall learn later, is the most important act of all and the most difficult to master.

HOLDING UNTIL READY TO LOOSE

Past works on archery have nearly always stressed the point that an arrow should not be held at full-draw longer than is absolutely necessary. In this, however, the present writer departed from the older standards shortly after he got really interested and began

to study the game. He insists on **HOLDING until he is good and ready to let go!**

This peculiarity in his shooting form drew considerable adverse comment from old-timers at the 1926 National Tournament at Bryn Mawr. However, after weighing the comments for what he thought they were worth, he continued to hold—simply because it contributed to continued better results. But let it be distinctly remembered that he uses a bow that is well within his powers of command—and that at the full-shooting-draw the bow is not worked beyond its point of elastic-limit.

We believe our example in this regard has been widely followed, for we have noticed a decided tendency to dwell longer on the draw even by many archers of note, in the past two years.

For fear that we have not already made it clear to the beginner, let us reiterate that—an arrow is not sighted down its entire length, like a rifle. The usual beginner seems to possess a natural mania for attempting this. Such practice would necessitate a very awkward position to draw to. It would also require such an awkward use of the drawing-fingers as to materially weaken their power.

No! As we have plainly described, we hope, the arrow is drawn so that the nock is **under the chin**, and only the **tip of the pile is used in sighting!**

A more detailed discussion of the act of **Aiming** will be given in later chapters. However, let us say here that the usual fault of the beginner in this respect is **aiming at the target!** He will aim his arrow at the **Gold** time after time, only to see his shafts miss the entire target. . . . And it never seems to dawn on him that they are practically all missing in the same direction.

AIMING TO HIT

There is an instinctive tendency to aim directly at the **Gold**—and to keep on aiming at the **Gold**—no matter where the missiles go.

We have seen intelligent people shoot at a target time after time, and continually miss it, say a little low and to the left. Yet when it was suggested that they alter their aim and shoot as if trying to hit a certain branch on a tree behind the target and a little to the *right*—they immediately began to drop arrows into the scoring

rings—and wondered why they had not thought of such a simple expedient before!

So let us state emphatically for the benefit of all archers, present and future, that **the purpose of shooting is to obtain hits.** Hits, no matter how obtained, count for points, and in practically every instance in shooting with the bow and arrow these are obtained by aiming **indirectly** at *something else.*

CHAPTER XXVI

LOOSING AND FOLLOWING

After the arrow has been drawn, held and aimed, an archer is in the same relative condition as the rifleman who has loaded, cocked, pointed and sighted his gun.

The rifleman's finger rests on a set trigger and it is only necessary to press it to send the bullet on its way.

The archer must release the bowstring before the recoil of the bow can do the same for the arrow. This act is commonly called the **Loose.** It takes but a fraction of a second yet it is the most important act of the entire performance.

No matter how well a shaft is drawn, held and aimed! No matter how carefully the archer has observed all other details—**he must loose it properly to obtain a hit!**

Good **loosing** is ninety per cent of archery technique. All other details can be learned quickly, but a reliable release can only be developed after most painstaking study and practice. It is more nearly akin to the trigger-squeeze of a revolver than any other act connected with shooting. A good loose, or release, is simply the act of letting the bowstring go to start an arrow toward the target in the most effecive manner.

THREE GENERAL LOOSES

There are three general classes of loose: (1) The **Creeping Loose,** (2) The **Dead Loose,** and (3) The **Lively Loose.**

In the **creeping loose** the archer opens his fingers by more or less relaxing the muscles, until the bowstring eventually slides off. This loose takes its name from the fact that during its operation the arrow gradually creeps forward a little before it actually starts. It is a faulty release, because the bow is eased a bit after it has been fully drawn and is ready to shoot; and a portion of its cast is sacrificed. There is also a tendency to unsteadiness and slight variation between successive shots.

We hold it to be a cardinal principle in shooting that the arrow

should never be allowed any backward movement, no matter how slight, from the moment the archer begins to draw it until the final release sends it away.

No prize-fighter would ever draw back his arm to deliver a punch, then let the muscles relax sufficiently to move his fist forward a trifle, before punching. This would take most of the "steam" from his thrust. Letting the arrow creep forward after the bow has been fully drawn has the same relative effect on the elasticity of the bow.

With the **dead loose** the fingers are suddenly opened and the string allowed to go forward from practically a dead position. It is much better than the creeping loose, but it is also apt to encourage faults.

The **lively loose** is obtained by actually drawing the bowstring a fraction of an inch more, just before letting the arrow go.

This should not be confused with the drawing of an additional length of arrow as deprecated on *Page* 194. It is more in the nature of unhooking the finger-tips with a slight backward draw or pluck.

The lively loose gives added cast to the shot and lowers the point-of-aim considerably. Its chief danger is that it is likely to degenerate into too much of a slash or jerk.

A clear understanding of these various actions is advisable. The beginner should get out his bow and arrows and experiment with each of these three general looses in their more or less exaggerated forms, to learn to judge of results obtained from each. It will also accustom his touch to the various feels of the bowstring.

TECHNIQUE OF THE ACTIVE-LOOSE

The most effective release is an active loose, but not one in an exaggerated sense. The movement is best described by saying that it is almost identical with the twanging of a harpstring with three fingers, to play a loud note. It is an active rather than a passive act.

On *Page* 190 we described the position of the bowstring across the ends of the drawing-fingers and saw that at the completion of the draw the string had been allowed to roll forward so the fingers acted somewhat like crochet-needles, and that a little pad of flesh that had been forced by the bowstring toward the ends of the

fingers was mainly responsible for retaining hold of the string.

As the right elbow is held high, the wrist of the drawing-hand is turned so the back of the hand is partly up and the string is across the fingers themselves, diagonally.

When the aim is completed and all is ready . . . it is only necessary to give a slight pluck—and off it goes. The string slips over the top corner of the fingers.

The fingers close and the hand comes back very slightly; but this is more in the nature of a reaction than a conscious effort, just as the hand would naturally come back after a similar pluck on the string of a musical instrument.

In properly executing this movement there is an almost imperceptible tightening and further draw to the arrow, so that absolutely no creepage is permitted.

The loose as thus described is decidedly lively without being in any wise slashing. The effect of the shot can almost be predicted with certainty before the arrow has left the bow.

THE MIND'S-EYE AT MOMENT OF LOOSING

We believe it is far better to concentrate the mind entirely on the loose at the moment of execution than to pay too much attention to the aim.

Too many archers actually over-aim!

If a high score is desired a large percentage of Golds must be obtained, with the great majority of other hits in the Red. So we have trained ourselves to aim first, rely on "freezing" in the correct position . . . then centre the whole attention on the act of loosing. We trust largely to luck that the aim is not disturbed during the slight period intervening.

The mind cannot divide its whole attention or "eye" between the two acts. So we prefer to concentrate it wholly on the loose at the final moment.

The delicacy of touch required for a good machine-like loose can only be acquired by practice. It is highly desirable to practise now and then with a weak bow, since with a weak bow an almost perfect release is necessary to get hits. The bowstring does not tear itself away immediately on the slightest provocation, as with a strong bow; and any error or clumsiness is magnified to a greater extent. A strong bow will give hits on the target, even with a bad

release, from sixty yards or less; but the error is present just the same.

If centre hits are desired the loose, more than any other factor, must be as nearly perfect in timing and execution as possible.

FINGER-TIPS AND LOOSING

Good finger-tips or a satisfactory shooting-glove are absolutely essential to best results. Likewise, the string should be well served,

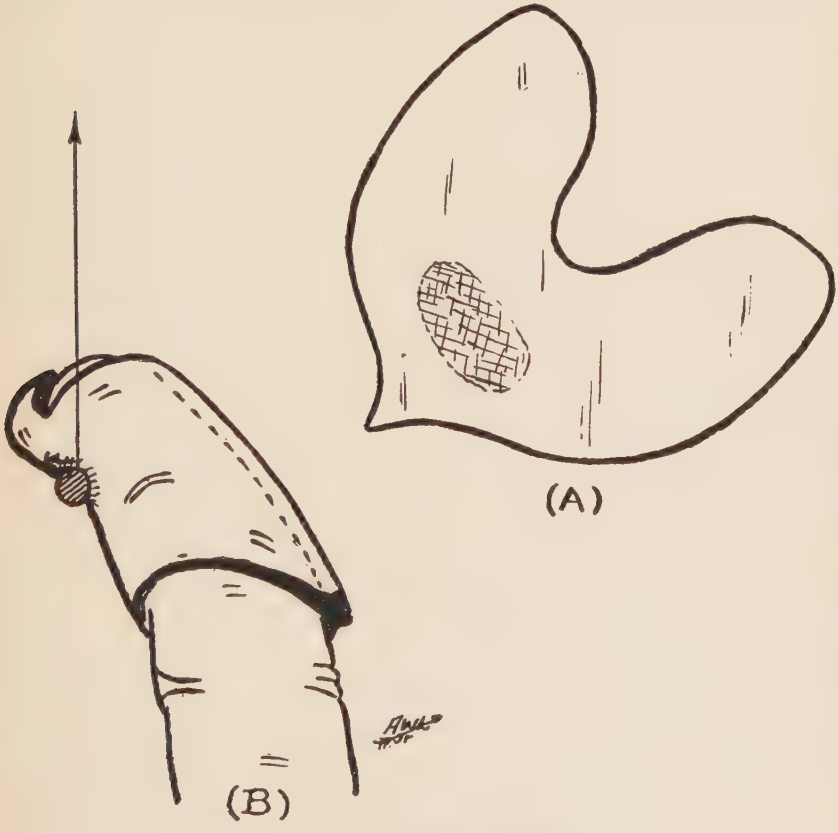


FIG. 54. FINGER-TIP DESIGN
(A) Patterns with scraped inner area.
(B) String action at sensitive point.

hard, and round at the middle. If the finger-tip leather is thick and soft the bowstring will sink too deep and cannot be gotten loose without a jarring effort. If too thick and hard the bow-

string cannot be felt through the tips, nor can the fingers be curled sufficiently to hook properly onto the string.

A reasonably hard, smooth-surfaced leather should be used. The writer finds the smooth side from bits of split cowhide very satisfactory. Before sewing the tips up the back he fits them roughly in place, then with a sharp knife cuts or scrapes a little of the leather away from the *inside* surface, to make the tip sufficiently flexible. This idea is shown in the two sketches of *Figure* 54. (*A*) shows the inside or rough surface before sewing, with the scraped portion shaded. At (*B*) we see the finished tip with the position of the thinner surface at the string. This treatment enables an archer to use thick leather for protection at the ends of his fingers, where the friction of the sliding bowstring is most keenly

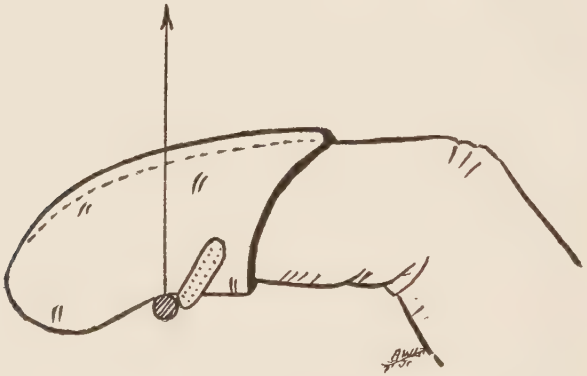


FIG. 55. FINGER-TIP WITH STRING-STOPPER

felt, without sacrificing "feel" during the draw. It also raises a slight hump at the end of the drawing-finger, to retain the string with the crochet-needle hook previously described.

In *Figure* 55 we have a type of finger-tip that has been used extensively in the past. The direction of the string's pull is indicated by the arrow, as it is also indicated in the preceding figure.

Where finger-tips with string-stoppers are used the ends of the fingers are hooked during the acts of drawing and holding. The stoppers are supposed to keep the bowstring from slipping *back* too far.

Many archers rub paraffine on their finger-tips and also on the string, to facilitate smoothness of loose. Some use talcum or soapstone powder.

Too many very fine archers do this to say it is wrong. However, the writer does not practice this refinement to the same extent. He does occasionally paraffine the serving, but more to fill it out and make it hard than to give it a degree of slipperiness.

If the archer uses hooked fingers in drawing, with finger-tips equipped with string-stoppers, the use of talcum or paraffine may be recommended. But with the other style its use is apt to make the trigger-like action too slippery and unstable. Instead, we frequently oil the finger-tips to keep the leather soft and pliable and sometimes chew and bite the ends during an afternoon to make them feel just right for best results.

FOLLOWING

This eighth and final act was omitted by Ascham. But it is a very important one.

What we term herein as **Following** corresponds to the "follow-through" as generally understood in the realm of all modern sport.

After releasing the arrow an archer should hold his position, as shown in 6, *Plate* V, with the bow-arm extended and drawing-hand under the chin, exactly as he stood at the moment the arrow left the bow.

It is wise to retain this position until the arrow has hit the target, even though the distance be 100 yards.

This may appear an affectation or pose, but it is not!

If the exact position of the body at the moment of release is retained the feel of the position registers on the sub-conscious mind. The eye can follow the flight of the arrow, and when the shot hits the target the feel of the correct aiming-position has been registered somewhere in the memory. Likewise, the feel of a miss is registered and errors better corrected at the next try.

This may sound like "court-room testimony" of a so-called psychophysical nature; but the fact remains that such **following** is a good habit to get into.

If an archer lowers his bow-arm too soon he is apt to acquire the habit of actually "pulling the shot."

It is much wiser to err on the side of holding the final position too long!

CHAPTER XXVII

THE FLIGHT OF AN ARROW

To better appreciate the principles of aiming it is necessary to thoroughly understand the important points in the flight of an arrow.

In the following diagrams we have endeavoured to simplify matters as far as possible. Consequently we have not drawn the bow, as it merely supplies the initial impulse to send the shaft on its way.

In *Figure* 56 the line **AB** represents the arrow; and the line **ABX**, its prolongation. If the eye were placed behind **A** and sighted along the top of the shaft, it would follow the line **ABX**, prolonged to infinity, and this would be the path taken by the arrow if it were

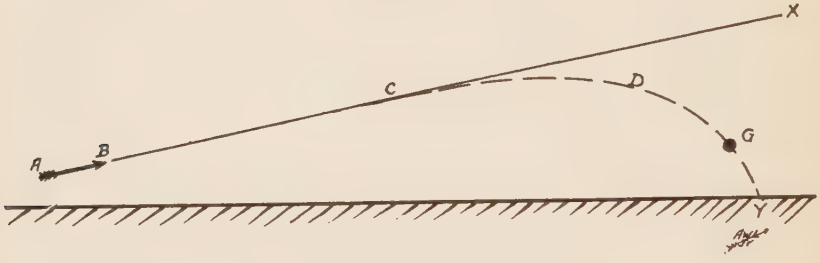


FIG. 56. FLIGHT OF THE ARROW
AX.—Line of Departure.
ABCDGY.—Trajectory.

not for the action of air resistance and the pull downward of the force of gravity.

Air resistance slows down the speed. Gravity pulls the arrow to earth.

As a result of these forces the actual path becomes the curved line, **ABCDGY**. It is termed the **Trajectory**.

The line **AX** is the **line-of-departure**. In the case of *Figure* 56, where the eye is behind the arrow, aiming along it, the line **AX** is also the **line-of-sight**.

We observe from looking again at *Figure* 56 that a fair-sized

mark placed anywhere between B and C would be hit by the arrow. In other words, to hit the mark if it were placed between the end of the arrow and C—we would sight directly at it. But from then on its initial velocity is lost and its speed gradually lessens. Gravity pulls it down, down, down! So if the mark were placed at D, G, or Y, or at any other point on the broken-line, it would be hit just the same, even though these marks are well below the actual line-of-sight, with its coincident line-of-departure.

This should make it self-evident that a mark that is placed at any considerable distance can only be hit if we give the arrow sufficient **elevation.** The shaft itself must actually point along a line considerably above the target.

At target-shooting with bow and arrow the **Gold** is the mark at which all shots are directed. It is placed to be practically on a

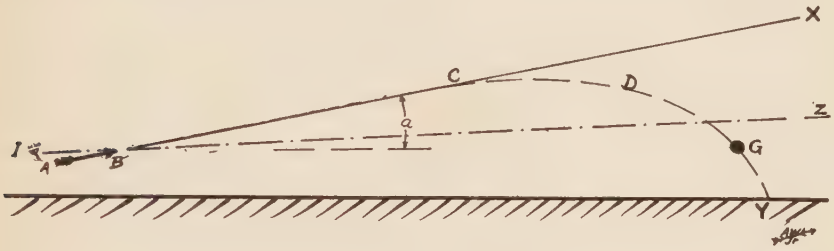


FIG. 57. AIMING DIAGRAM
AX.—Line-of-Departure.
IZ.—Line-of-sight.
ABCDGY.—Trajectory.
a.—Angle-of-departure.

level with the nock of the arrow. Therefore the point G, which represents the position of the **Gold,** would be the only point on the trajectory that directly interests us.

In the actual shooting of an arrow physical considerations preclude sighting along the arrow itself—as we would do in aiming a rifle.

As explained in previous chapters on Drawing, Holding and Aiming, we draw the nock to some point under the chin and sight over the point of the arrow. With this change in the method of aiming the previous diagram must be modified. A new diagram, which takes this difference into account, is shown in *Figure* 57.

The position of the aiming-eye is at I.

The line IBZ becomes the **line-of-sight.** The angle a between

the **line-of-departure AX** and the horizontal is the **angle-of-departure.**

These two diagrams represent flights of an arrow shot over considerable distance, or at a **high-angle-of-departure.**

With the foregoing basic elements firmly fixed in the mind and definitely understood we will now consider the three main divisions of aiming: (1) **Point-Blank Range,** (2) **Short Range,** and (3) **Long Range.**

The first and simplest for the beginner to consider is the **Point-Blank Range.** At this the **Gold** itself is actually the point aimed at!—a condition that is rarely met with in actual shooting.

Men who habitually shoot the American Round, and use bows of about forty-pounds draw, usually manage to get their **point-of-aim** on the target at sixty yards. That distance, therefore, is their **point-blank** distance. With the writer it is somewhere between eighty and one hundred.

It must be remembered that an essential difference exists between **point-blank range** for the bow and arrow and for the rifle!

With the rifle we sight along the top of the barrel, and the bullet goes with terrific velocity. It goes practically straight for a considerable distance, so it is often not necessary to raise the rear-sight, to allow for an appreciable drop, until several hundred yards is passed. Therefore a rifle is said to shoot "point-blank," at any considerable mark,—at any and *all* distances up to the so-called limit of the flat-shooting distance.

But with the bow-and-arrow sighting is not done along the shaft at all. The velocity of the arrow is comparatively low. Consequently its range is limited and the trajectory is a distinct curve almost from the beginning of flight.

In archery, therefore, the term "point-blank" can apply only to some one definite range between the maximum range capable and the shortest practicable shooting distance.

The **point-blank range** also varies with different individuals using the same bow and arrows, since no two persons handle the implements exactly alike.

From the foregoing it ought to be clear that in shooting with the bow and arrow we either shoot at **less-than-point-blank range** or at **greater-than-point-blank!**

And since we have no rear-sight to raise or lower on the arrow, it becomes necessary to make use of some other method of aiming-

allowance than the rifleman employs. Instead of raising or lowering the rear-sight and sighting on the mark itself, as is done with the rifle, we archers must use an auxiliary mark, called the **point-of-aim**, with which the reader will soon become familiar.

Let us assume that the shooting range takes the form shown in *Figure* 58, and that the archer is shooting from the actual point-blank distance.

The target is shown placed against a high wall, and the archer shoots from even ground so the **line-of-sight, IG**, is practically level.

But there is a depression in front, so the base of the wall is well below the **Gold**.

If the arrow is properly shot it will follow the trajectory shown by the broken line, and will ultimately hit the target at its centre, **G**.

The two lines **IG** and **ABCDG** intersect at **G**. Thus, in this special case the arrow actually hits the object aimed at.

But let it be noticed that, although the **line-of-sight, IG**, is practically horizontal, the arrow is pointed upward at the start. This initial upward angle of the arrow results because its nock must be held below the chin, which is considerably lower than the aiming-eye.

By observing the two phantom-targets on *Figure* 58 we see that at any other distance than the **point-blank range**, an arrow that is aimed at the **Gold** itself will completely miss the mark.

In rifle-shooting at extreme ranges, the same parabolic trajectory is present, and the rifle-barrel must be pointed upwards at a considerable angle. The only essential difference between the two weapons is that the gun stays behind after a shot is fired, whereas the arrow itself does the flying.

THE ARCHER'S POINT-OF-AIM

On the gun-barrel we can affix a movable rear-sight that can be adjusted to obtain the correct **angle-of-elevation**, which is impossible on the arrow.

We can have no sight whatever of this nature on the shaft itself; and as the **angle-of-elevation** varies through a large degree over comparatively short ranges, we must dispense with all idea of aiming at the **Gold** itself. We must substitute some other method.

So we are compelled to aim at some entirely different object, in expectation of hitting the **Gold**.

As long as we can pick out some fixed object in the correct rela-

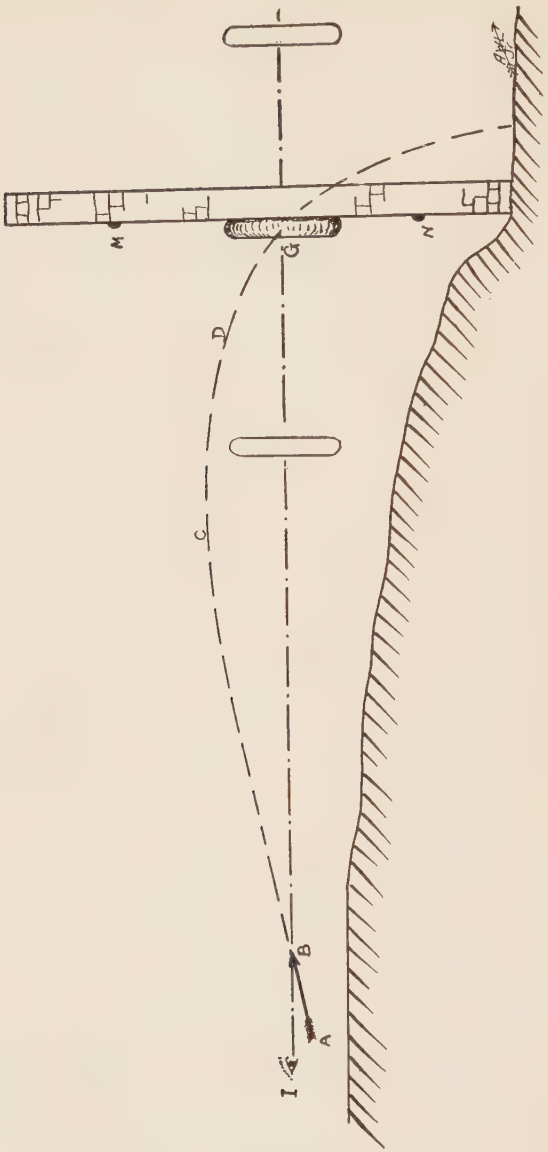


FIG. 58. PRINCIPLE OF THE POINT-OF-AIM

tive position—and always shoot from the same spot and in the same manner each time, we can dispense with the adjustable rear-sight.

This secondary object is known as the **point-of-aim.**

It is always *directly above or below the Gold,* save for any slight compensations necessary to correct for windage or other side-shooting tendencies.

Thus, if we have our target fixed to such a wall as shown in *Figure* 58, we can place a suitable mark above or below the **Gold** to aim at, and by properly locating this **point-of-aim** can continue to shoot with accuracy and hit the target.

If we shoot at ranges in *excess* of point-blank we must give the arrow a greater initial-elevation, and the **point-of-aim** will be placed *above* the Gold—such as at **M.** But if we advance and shoot from a *shorter* range, we must shoot at a point actually *below* the Gold—as at **N.**

Under actual shooting conditions, however, we do not have such a convenient wall on which to pin our auxiliary **points-of-aim.** Nor is there a convenient depression in front of the target, so a point like **N** can be placed on a level actually below the surface of the ground. But by putting an object on the ground as shown in *Figure* 59, at **AP** (abbreviation for point-of-aim), we can obtain the same optical effect.

By placing **AP** closer to, or further away, the **angle-of-elevation** is lowered or raised.

The proper position for **AP** is located by trial, and once found it should be a simple matter to shoot successive arrows into the target.

POINT-OF-AIM ON THE GROUND

Archers mark the position of **AP** by putting out bits of paper or some other mark, easily distinguished, from the shooting-line. A white golf-ball makes a splendid **point-of-aim.** To prevent its being accidentally kicked away it may be mounted on a spike and stuck in the ground.

Since the object of target-shooting is pure accuracy, the practice of putting out artificial **points-of-aim** on the ground is justified. Strictly speaking, such practice is not warranted and an archer should be required to judge of the proper location by spotting a dandelion, tuft of grass or other pronounced spot that would

serve. In hunting or in warfare it would be ridiculous to suppose that game or an opponent would let an archer carefully step off the required distance, lay a convenient reference-point on the ground, then step back and take his shot. Such archers must either rely on their ability to estimate distances and judge of the proper location of their **points-of-aim** in the natural manner, or put the **point-of-aim** on the bow itself, as is done on the gun. However, it has long been the custom for archers to put out their marks as they please, just as at rifle-matches wind-flags, wind-clocks and other refinements, not allowable under actual combat, are used.

Let us now step back and shoot from a distant point from which

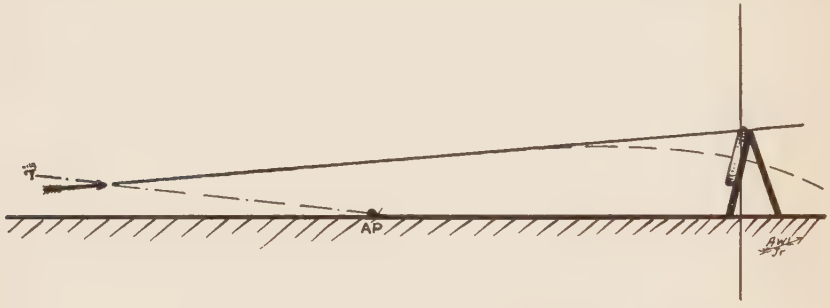


FIG. 59. POINT-OF-AIM FOR SHORT-RANGE

it is necessary to aim above the target in order to get the arrow to it, as depicted in *Figure* 60.

We are near the end of the bow's effective range.

The trajectory falls off rapidly and it is necessary to start the arrow at a decided **angle-of-departure** to so much as get it to the target.

When this angle equals forty-five degrees, we have the maximum range possible. Any higher degree of aiming will only cause the arrow to fly *higher,* but come to earth at a shorter distance from the shooter.

POINT-OF-AIM ABOVE THE TARGET

If we were shooting at a distance only slightly in excess of the **point-blank range** it would only be necessary to sight on the top-edge of the target. If the distance is still greater we must put our **point-of-aim** at some point above the target.

If the target were hung on a high wall, as that shown in *Figure*

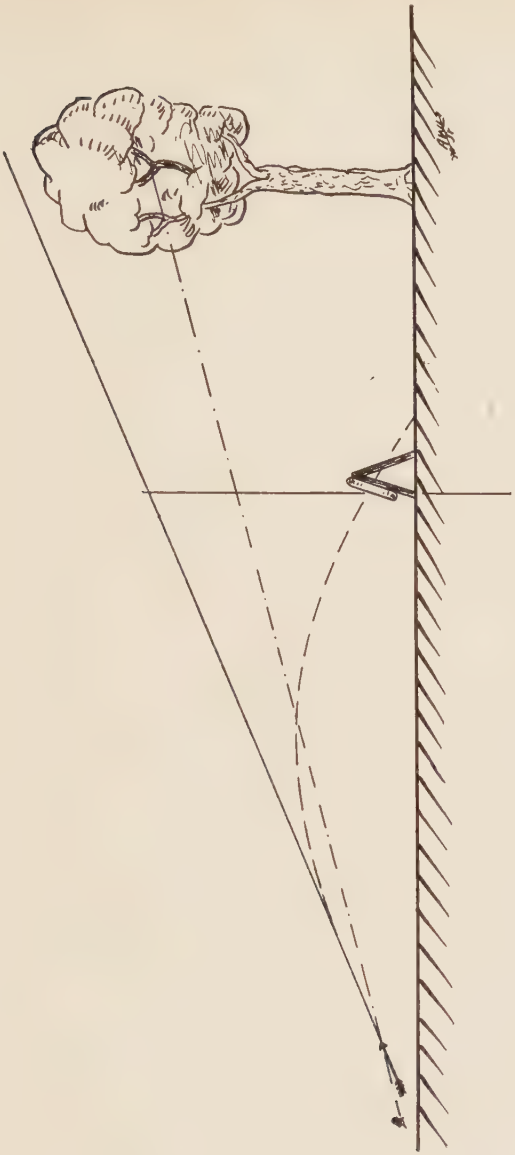


FIG. 60. POINT-OF-AIM FOR LONG-RANGE

58, we could pin an **AP** on the wall itself, as at **M**. But in actual practice there is no such convenient wall available. Nor is there any place as a rule where we can conveniently place such a mark, particularly one that could be moved at will—like the **point-of-aim** we can put conveniently on the ground.

The best we can do is to survey the background in rear of the target for a suitable reference-mark.

If there is a background of tall trees we can usually locate a suitable fork and sight on it, as shown in *Figure* 60. We may move slightly to the right or left, in standing, to get the **AP** over the **Gold.**

Telegraph poles, chimneys, church spires, buildings or other stationary objects properly located behind the target serve admirably for **long-range points-of-aim.**

Private ranges and local club grounds are nearly always laid out to assure a good background. But lucky is the archer who can find a suitable point at just the right place behind the target on which he is assigned—at a tournament! There he must shoot from and to a given position, must take what fortune favours, and do the best he can.

The necessity for an extremely high point-of-aim is the great reason why most archers shy at the longer ranges. For sixty yards and under it is comparatively easy to use a bow strong enough to get **points-of-aim** below the target; but at the eighty- and 100-yard distances of the York Round it is different. With the ordinary bow the **AP** is so high that not even the highest trees are ordinarily high enough.

Sometimes the moon is in the right position or a convenient cloud might be used. For a single shot such an expedient might serve very well, but for an afternoon's shooting celestial bodies prove unreliable!

Nothing is so exasperating as a **point-of-aim** "in the sky." Unless the archer can make use of some other expedient he is at loss for something definite to aim at, and must shoot more or less by estimation.

ADVANTAGE OF STRONG BOWS

The most obvious remedy for a high **point-of-aim** is to use a stronger bow; but the temptation to rely on this expedient is the

ruination of many a prominent beginner. With a fast bow, drawing on an average between fifty and fifty-five pounds, the **AP** can be lowered to the target at 100 yards; but, although many men are able to draw such a bow easily, very few develop their loosing-muscles to the point where such a strong bow is advisable. The slight gain at the longer ranges is usually more than nullified by losses in greater proportion at shorter ones. A bow drawing between forty-two and forty-five pounds, properly used, ought to give a point so low that if a convenient tree or building is behind the target it would be available for use.

No matter what is said and done the fact remains that only an archer of exceptional ability can overcome the handicaps and difficulties incident to shooting at eighty and 100 yards, and obtain consistent good scores at these distances. It is for this reason that the average archer follows the path of least resistance and shoots where hits are easy. It also explains why the York Round is considered the test of real archery skill.

DANGER OF OVER-AIMING

Let us reiterate! Although it is necessary to devote a lot of care and attention to the **Aim** and to methods of aiming, the actual act of aiming is only one of the plays to be considered. It requires mental and optical concentration to aim. It also requires mental effort to direct the other factors necessary to accurate shooting. To **over-aim** is apt to cause lack of proper concentration or mental direction elsewhere. Bearing this fact in mind we will in following chapters further elucidate on the aiming process, with a warning to beginners—not to try to master the technique of aiming at the expense of slighting others of equal importance.

CHAPTER XXVIII

MORE ON THE ACT OF AIMING

In the preceding chapter we considered the elements of Aiming relative to the flight characteristics of an arrow. In this we intend to devote more attention to the physical act of aiming.

We again state that the beginner can well afford to let the true details of aiming alone until he has first mastered the technique of Standing, Nocking, Drawing and Loosing. Far better results will really be obtained in early stages of the game if both eyes are kept open and the direction of shots left entirely to estimation. Then, gradually, more and more attention can be given attempts at scientific direction of the arrows.

In the old days of archery, in fact not so long ago, an archer was enjoined to rivet his attention on the mark to be hit, just as the baseball pitcher looks intently at the plate, and throws where he looks. Even in the advanced stages of aiming it is proper to look intently at the target at the moment of loose—for if one's attention is so directed the arrow seems eager to obey the glance and likewise go toward its intended objective.

The act of shooting with the bow-and-arrow is a mental as well as a physical effort, and the archer who desires to succeed must be a keen student of self-psychology. He must learn to diagnose and compensate for mental as well as muscular reactions.

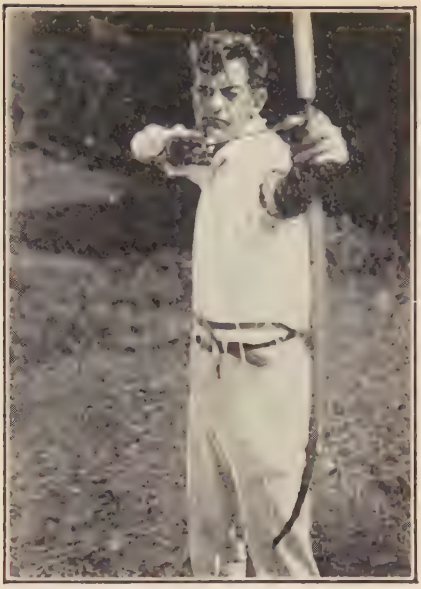
Archery, like other sports, cannot be learned from books. Yet the ambitious archer can learn a great deal from reading; and particularly from observing the form and methods of the more successful performers.

But, to paraphrase Lord Beacon, "Read, watch and listen, not to accept, but to weigh and consider!"

The writer has followed a varied line of sports and has been more than moderately successful in more than one; but in no one has he found so much variety of opinion as amongst archers. There are so many little things, many apparently insignificant in importance, that must be considered.

Misses are frequently blamed on totally erroneous causes. It

HOLDING



AIMING

STAND

6-52

PLATE VI. DR. PAUL W. CROUCH

therefore behooves the novice to weight advice very carefully, or he is apt to be led even farther astray by enthusiastic but incompetent preceptors.

COMMON SENSE

In archery matters as in most other lines of endeavor *common sense* usually prevails. If the student will but recognise the simple basic facts and reason logically and simply on the problems at hand he will usually find a path out of difficulties.

Listening at night to the arm-chair expert is very interesting and diverting, one of the great pleasures of archery. But in accepting advice take care that it comes from one competent to give it, and is not the usual near-wisdom that emanates in great quantities from that brotherhood of enthusiastic dubs, whose powers of expression are usually in inverse proportion to their actual understanding or abilities.

The score is the thing!

The archer who habitually makes high scores is apt to be a most reliable source of information; but more can be gleaned from watching his actual performance than by hearing his methods talked about.

The great purpose of archery, let us repeat, is to hit the Gold! A miss, no matter by what technique, counts for *nothing!*

An *accidental hit* may be misleading. It is the consistent hit that we refer to.

ONE "GOOD" ARROW

We have often seen archers who claimed to have one good arrow with which they always got hits. Observation showed that the "good" arrow was in reality a bad one, and that when the point-of-aim was altered according to conditions, the one arrow thought good—now missed! . . . But three or four of the previously considered "bad" shafts began to hit.

Certain definite principles have been developed in the matter of good form or technique. Observance of these will insure more consistent shooting. By following these time-tested methods, varied possibly a little to fit the individual, we are apt to get the best scores.

We do not want to be misunderstood as wishing to discourage

innovation. We believe that the best scores are yet to be made, and possibly as the result of some sound alteration or improvement in existing methods. But these innovations will not be in the nature of freak stunts, or in any one of a thousand and one odd ideas that have already been advanced and discarded many times.

The student-archer must learn, above all things, to distinguish errors. The great Horace Ford himself was not perfect, and it would be foolish to follow every detail of his technique—simply because *he* did it!

When the beginner has more or less mastered the other details, so his arrows go smoothly toward the mark, and his technique loses its original clumsiness, he can begin to concentrate more and more attention on the act of **Aiming**.

The time will eventually come when the other acts will become subconscious and involuntary, and then the entire attention can be directed to the **Aim** and **Loose**.

Let us now consider that we have reached that point!

DIRECT AND INDIRECT-VISION

In perusing older books on archery we become acquainted with what is known as **direct** and **indirect-vision**.

If possible, get Ford's work on Archery, since it will throw a different light on the subject from that obtained herein.

In sighting an arrow, as with sighting a rifle, we must observe two different objects at the same time,—the front-sight and the target. The front-sight is a comparatively close object but the bull's-eye is far away. The eye must be brought to a different focus to see either with a clear image.

In archery we must observe three principal objects—the **arrow-point**, the **target**, and the **point-of-aim**. And since each one is at a different distance from the pupil three different foci are necessary to clearly define them.

When we look at any given point in the distance we see that particular object most clearly. At the same time we observe in a more or less ill-defined manner the surroundings. We see the first point by **direct**, the others, less clearly defined, by **indirect-vision**.

The most perfect example of direct-vision, perhaps, is observed when the eyes of two persons meet. All else that is seen at that time is observed by indirection.

In target-shooting with the bow and arrow either the end of the pile, the point-of-aim or the Gold is observed intently at any one instant. The other two must be seen indirectly. If the three are in practically the same straight line, by slightly throwing the eye out of focus for any one—all three can be made to register at about the same degree of definition on the retina, but neither is seen sharply.

It is well for the student to get into position with his bow and an arrow, and check these points for himself. It is not necessary to draw the string.

If possible go through the actions of aiming and sighting before a target. Stand on the fifty-yard line, and have a clearly defined point-of-aim on the ground about ten yards in front of the target.

Hold the bow-and-arrow in aiming position.

If both eyes are used and the focus set sharply on the point-of-aim, the pile of the arrow will be slightly blurred, but still discernible in the direct vision. If we now shorten the focus so that it is fixed on the point of the arrow, the point-of-aim blurs. All the while, however, we also see the target.

DOUBLE IMAGES

Let us still keep both eyes open and alternately change the focus so it rests, now on the point-of-aim and now on the pile.

The brightly painted target remains all the while clearly apparent in the background. Suddenly it appears to divide in two, and you find yourself looking at *two* target-images. An uncoordinated image of the conspicuous target-face is impressed on the retina of each individual eye. It appears like the Moon to an inebriated "astronomer."

This apparition is confusing enough with a single target; but if the archer is facing a line of many targets he sees so many different images that he is apt to imagine he is trying to aim a single arrow at an army.

AIMING WITH ONE EYE, ETC.

If the aiming is done with the right-eye alone these double images are effectively cut off, and the three points can be fairly well observed with minimum confusion.

In hunting, where the game is apt to move and where extraneous influences prevent leisurely shooting in proper technical form, the use of both eyes may be necessary. But the target does not move away and an archer has all the time he wishes in which to execute his shot.

There is also likely to be confusion as to which is better: to look at the Gold with direct vision and see the pile and point-of-aim by indirect; or whether to look intently at the point-of-aim, and let the Gold be seen indirectly.

Personally we shift the glance back and forth, from one to the other, until the positions of sighting are definitely established.

Theoretically, if we aim carefully and loose, the position of the Gold itself is not important! If the point-of-aim is above the target we cannot see it anyway, since the target is hidden behind the left wrist. However, if the target does appear above the pile, as it does at most of the ranges shorter than sixty yards, a psychological factor enters. If the Gold becomes the object of attention at the moment of releasing, the arrow seems to be attracted towards it.

Therefore if the non-aiming eye is open just before this action and the target is brought into direct view, the shots often seem to insist on going down the range under better control.

It is not necessary to close the left-eye tightly to aim only with the right. If it be squinted a trifle while the right-eye is doing the sighting confusing images are effectively shut out.

SHIFTING THE GAZE WHILE AIMING

If the gaze is to be shifted, as we prefer personally to do, the archer must first draw to the point-of-aim, then rely on his ability to "freeze" in that position while his attention is directed elsewhere.

When the point-of-aim is on the ground in front of the target the writer draws immediately to the pile.

The right-eye sights the tip of the arrow on the point-of-aim.

The focus of the aiming-eye is then altered and the eye run up and down the full length of the shaft, to check its position and see that it lies wholly under the aiming-eye.

The gaze is then shifted again and the fact ascertained if the *Gold*—or that part of the target which is actually aimed at, if allowances for right or left variations are taken into account—is exactly over the middle of the shaft.

If it is difficult to see the points in question distinctly both eyes are used, but all actual aiming is done with the right-eye alone, the left-eye being squinted rather than tightly closed.

THE MIND'S-EYE AT MOMENT OF LOOSING

When the position of aim is finally established the *mind's-eye,* or mental attention, is fixed entirely on the forthcoming release.

Sometimes we continue to look intently at the pile, ignoring the target entirely. Sometimes we shift the gaze, open both eyes, and look primarily at the target as we do the loosing.

As with other details in the technique of shooting, a change in method often helps get an archer who has gone stale out of a rut.

The actual act of aiming is difficult to describe; and, although the description is lengthy, the time required to complete the act takes but several seconds.

To aim in this manner requires a longer hold than has been customary; but if the archer uses a bow that he can properly command, this is not a serious factor.

This attempt to explain our personal ideas and method may be hard to grasp, and the method may not work for others precisely as it works for us; but we have described as nearly as we could a method that has been producing good results. And results, as mirrored in the score-columns, are what really count! During the past year or two we have consistently averaged American Rounds in excess of 90-600 with about twenty-five *Golds* to the round, and we do not believe this would have been possible unless the methods employed were sound.

When the point-of-aim is above the target the confusing and distracting influence of the target itself is not apparent. The target is invisible and the shot is made entirely by indirect-aiming. Here the main problem is to obtain a satisfactory point to aim at.

Where there is nothing but sky against the tip of the arrow it is often customary for archers to aim with the bow-arm down, to put the arrow first in line with the target. The bow-hand is then raised to an estimated elevation and the arrow loosed. The success of the shot depends largely on the ability of the shooter to judge or shoot by such a semi-estimation method.

CHAPTER XXIX

SIGHTING DEVICES

The bow-and-arrow is a projectile weapon and since its inception various means and devices have been used to increase its effectiveness. Chief of these have been contrivances and improvements to enable the archer to obtain the greatest number of hits per arrows shot. But a correct appreciation of the principles involved in scientific aiming seems understandable only by peoples having a high order of intelligence. We see the average savage or barbaric archers relying mainly on crude instinct for accuracy.

The most important advance in the art of shooting, as we have seen, came with the innovations of Horace Ford.

His idea of shooting with the arrow drawn entirely beneath the aiming-eye and his employment of the principle involved in the point-of-aim method of sighting were revolutionary.

Although Ford is generally credited with having originated the idea, it is certain that he was by no means the first to conceive of the method as generally applied to projectiles. And some lesser archer might even have suggested its adaptation to bows and arrows to Ford. But it is generally conceded that Ford was the first archer who actually demonstrated the soundness of the method, and modern archery dates from the time that he began making his phenomenal scores.

We explained the meaning and use of the point-of-aim in preceding chapters, and saw that all aiming was divided into three general classes—short-distance, long-distance and point-blank.

The condition in which the point-of-aim is on the Gold itself is ideal. Therefore why not do what the rifleman did—devise some method of aiming whereby the point-of-aim is on the target at all distances?

Since the target is hidden behind the bow and forearm at distances in excess of the point-blank range this suggestion is useless. But some sort of device that can be used at the lesser distances is feasible. However, since no front-sight in the true sense can be put on the arrow itself, it is necessary to locate it on the bow.

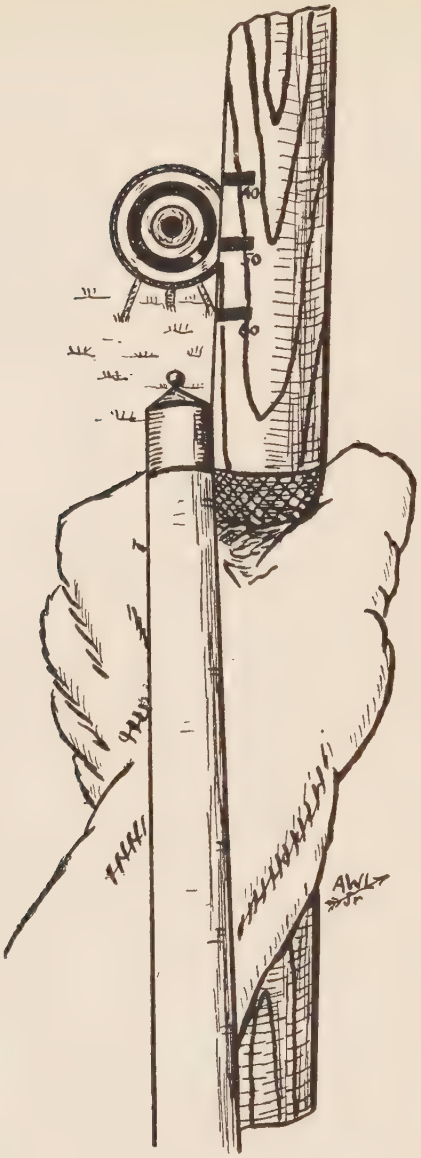


FIG. 61. AIMING-MARKS ON BOW

SIMPLE SIGHTING DEVICES

The simplest aiming-device is a mark on the bow itself, to give the archer a convenient reference-point for determining the proper elevation.

In *Figure* 61 we see the arrow properly sighted with the tip of the pile just below a point-of-aim supposed to rest on the ground several yards in front of the target. We also see that a mark on the bow itself is on a level with the bottom of the Gold.

So long as the arrow points in the right direction, it is immaterial whether we judge of its elevation by sighting the pile on an artificial point-of-aim, or whether we bring a proper mark on the bow to a position even with the Gold.

This method is perhaps the simplest way of sighting. It is merely transferring the point-of-aim from the ground to a convenient position on the bow. Many archers use this device. Three such marks are frequently made on the bow, giving respectively the supposed proper elevations for the three distances of the American Round, namely, 60, 50 and 40 yards.

The use of different coloured dots painted on the aiming-side of the bow, corresponding to 20-yard intervals in range, ought to be of great assistance to hunters.

The main fault with this idea is that the marks or dots are not adjustable. Allowances for varying conditions cannot be met by a slight deviation in the setting, to bring the point-of-aim on the Gold at all times. Nevertheless, in spite of this objection, this method is sound and reliable in the hands of a good shot.

A rubber-band may be used to slide up and down the bow; but, owing to the shape of the bow near the handle, the rubber-band is apt to change its position without notice.

To improve on the sight idea various means have been adopted to attach a movable sight, as a fixture, to the bow.

These sights on the bow were never highly regarded, in fact seemed to be laughed at, until Dr. Paul W. Crouch won the National Championship while using one in 1925. Since Crouch demonstrated the soundness of the idea in a most convincing manner, various devices of this nature have sprung into widespread use during the past few years.

In shooting with the bow-and-arrow we must never lose sight of the fact that the important use of the weapon was as an imple-

ment of war, and that any device or method that could be successfully used to increase the efficiency of the weapon in the face of an enemy would be hastily adopted by any thinking people. And since no hostile archer in his right mind would permit us to walk off a measured number of paces in front of him and put down a point-of-aim to help us direct barbed shafts at his anatomy we would have to dispense with the point-of-aim idea as it is employed in target-archery. But no foe could keep enemy archers from attaching a device to their own bows, any more than an Allied soldier could prevent a German sniper from using a telescope on his rifle in the Great War.

This analogy shows us that, so far as real propriety is concerned, the use of a sight on the bow is a logical idea.

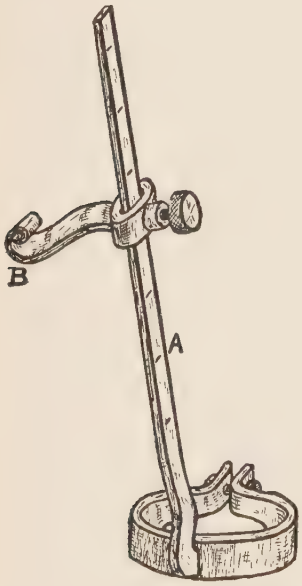


FIG. 62. THE SHEPARDSON BOW-SIGHT

THE SHEPARDSON SIGHT

The sight used by Dr. Crouch was made for him by that ingenious archer, Abner Shepardson of Melrose, Mass., who also made the bows used by Crouch in his record-breaking performances.

The actual sight appears in some of Dr. Crouch's pictures on the half-tone plates. It is shown in principle in the drawings, *Figure* 62 and *Figure* 63.

Essentially the device consists of a heavy brass ring that clamps snugly around the bow a short distance above the grip. A slender brass rod (**A**) projects upwards about five inches. This supports a horizontal slider-rod (**B**), which projects to the left and terminates in a peep-hole.

The upright rod (**A**) is bent to slant at the angle required to compensate for the angle at which the bow is held by the archer while aiming. It therefore remains in a truly vertical position when the bow is drawn.

When the peep-hole is set at the correct elevation, the archer aims by sighting through it at the Gold, as shown in *Figure* 63.

The upright rod (**A**) is graduated or marked, to record settings for various distances. Once set for any particular distance the

peep-sight is supposed to put the point-of-aim on the Gold for all subsequent shots at that range.

To persons acquainted with the adjustable sights on a military rifle, the absence of any wind-gauge is apparent. However, since this sight is only available at the shorter ranges, where the effect of the wind or other side-drift is so slight as to be practically negligible, this is not a serious disadvantage. Any necessary allowance can easily be taken care of by aiming at some other portion of the target instead of at its exact center.

However, it would be very easy to construct such a sight with a side adjustment if desired.

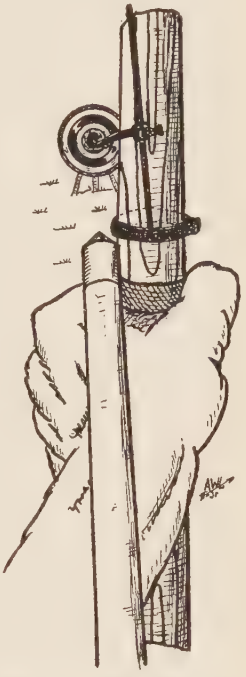


FIG. 63. THE SHEPARDSON SIGHT IN USE

THE LAMBERT SIGHT

Figure 64 shows the Lambert sight, so called because the writer, who devised it, was the first to fully understand it and make use of its "mysteries."

This sighting device can be clamped to the bow at any position, either above or below the handle. In *Figure* 64 we view it from the front of the bow, in the normal position for short-range shooting. Notice that the point —which can be made with a peep-hole if desired—can be adjusted both for range and "windage."

The great Horace Ford made his marvellous scores without any sight on his bow. Yet in the Butt's edition of his *Archery* is mentioned the *"sight"* used by Mr. James Spedding, a contemporary of Ford. So the idea is not a new one. As a matter of fact the bow-sight has been taken up and discarded time after time by archers who tried it and found no benefit from its use. We believe, however, that such abandonment was dictated largely by the old inclination to follow tradition. Simply because Ford did not use a sight the great mine-run of archers evidently assumed that the sight was no good.

It was the common boast several years ago that no important match had ever been won by an archer who used a bow-sight. A

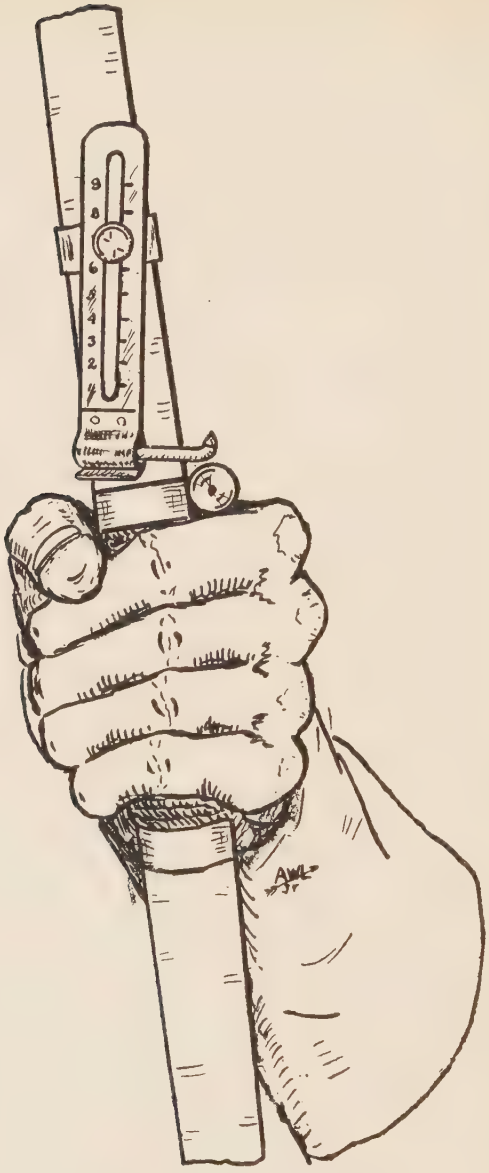


FIG. 64. THP LAMBERT SIGHT
Short-Range Setting.

letter from Dr. Paul W. Crouch on the subject says: "It seems funny that the sight was looked upon as a joke until I won in 1925."

ADVANTAGES AND DISADVANTAGES OF SIGHTS

In our opinion the use of a sight is mainly for convenience. It obviates placing a point-of-aim where it may be kicked over by a careless companion. It also eliminates the bothersome necessity of making continued trips half-way to the target, either to set some marker in the right spot or to make later changes in its location that may be advisable.

A bow-sight does not confer any extra hitting-ability on a poor archer. In fact, we believe that until an archer becomes somewhat expert the sight is a disadvantage, and that better results will be secured by trusting to the old point-of-aim method.

The writer has made American Rounds in excess of 90-600 both with and without the sight. He uses the sight—as will be explained in the next chapter—at 100 yards; but shot the 100 yards at the 1928 National Tournament without one and made a 49-229 for the seventy-two arrows, following this with a 44-186 for the forty-eight shots at 80 yards.

After an archer has passed 90-600 for a single American Round extra points are exceedingly hard to get, and any and all refinements in the art must be employed, as the archer sees fit, to get additions. Except, perhaps, for this, the use of a sight on the bow is mainly a matter of convenience and is a handy device to employ if one *can* use it.

The great disadvantage of a sight is that it tends to encourage over-aiming on the part of a novice. As we stated once before, the act of Aiming is but one of the many acts in shooting, and any marked tendency to overconcentrate on this single department at the expense of the Hold, Loose or other important trifles, is only to court greater inaccuracy.

Instead of simplifying matters, the sight in reality adds two or three additional factors to the already long list of things that the archer must watch. And while it may furnish an expert with the means of added concentration for a few additional points per round, over what he might obtain without it, it is of no use whatever to the archer who cannot already perform well without one.

Dr. Crouch, on this subject, writes: "As a matter of fact, unless

an archer is 100 per-cent fit and his muscular co-ordination perfect, the sight is a detriment. As you say, it only adds two or three more factors to be taken into consideration. Most important is keeping the ball directly over the arrow. Unless this is done you shoot high right or low left. I have about come to the conclusion that I can make a better score with a point-of-aim but favor the sight for its convenience. . . .

"For a matter of comparison on Saturday, May 29th (I think) 1926, I shot a 932 Metro and on Sunday, May 30th, I shot a new bow—*NO SIGHT* (heard sights were to be barred) and with Jimmie Duff scoring, I shot a 902 Metro . . . furthermore, never did use a sight at 100 yards and only half the time at 80."

CHAPTER XXX

THE LAMBERT SIGHT AT LONG RANGES

The ordinary sighting device hitherto found on bows was simply a substitute for the point-of-aim, as the latter was used at short distances.

But when the distance shot at is in excess of the point-blank range such a device is useless.

At the long ranges, as at 80 and 100 yards, the point-of-aim is so high for bows used by the average beginner that he dislikes shooting at these ranges.

However, hitting becomes so easy at sixty yards or less with the better archer, that he likes to go back; and when he is shooting for pleasure, instead of with the intent of making a score, an archer of pronounced ability will usually be seen shooting away from 100 yards. The flight of an arrow from this long range is fascinating to watch and the dull thud as it strikes the target produces a thrill that is absent at the lesser distances.

But shooting at 100 yards is more difficult than the mere proportion of the distances would indicate. However, if an archer uses a bow that is not too weak, but that will easily carry the distance without too high an arc in the trajectory, the accuracy possible with the bow and good arrows is almost beyond belief.

If the shooter has the other acts under proper control, and knows his matériel, hits are merely a matter of proper aim.

Weak bows are useless for 100-yard shooting. Very strong bows are too hard on the archer. The average shooter, however, can easily handle a bow drawing between forty-five and fifty pounds, to get onto the target at angles-of-departure of about twenty degrees. This will give him a natural point-of-aim that varies from approximately the top of the target to a height of about fifteen target-diameters above the target.

At the long ranges it is common to use the angle subtended by the target itself as a unit of estimation.

Thus, if we aim, say, at a "target and a half" above the target,

we would be aiming at an object, such as **M** in *Figure* 58, six feet above the top edge of the target, or eight feet above the **Gold**.

But since the object that we use to aim at is seldom at the same distance as the target itself is—being usually far behind it—we must use an angular system of measure. So the apparent width of the target is a natural aiming unit-of-measure in archery.

We have noted in previous chapters that convenient marks for points-of-aim at 100 yards are often conspicuous by their absence. Often on a strange range, particularly at tournaments, nothing but a bare sky-line is seen behind the arrow. This, therefore, leaves nothing definite to aim at.

To obviate the necessity for a conveniently located reference-point the present writer developed a system of off-set shooting or true indirect-aiming. In this the target itself plays no direct part in the aiming, since it is fully concealed behind the handle and is entirely ignored. It simply functions as the recipient for properly directed arrows.

DIRECT AND INDIRECT-AIMING

In ordinary rifle-shooting the mark is always seen by the aiming-eye. The aim is **direct.**

But in long range artillery work with modern guns the target is seldom seen. The gun itself is usually hidden behind a hill or forest or placed in some effective place of concealment. In aiming it only the location of the target is known. Yet by a system of **indirect-aiming** hits are effectively registered.

With the method of fire used by artillerymen in mind, the writer developed a similar method for using the bow-and-arrow, which has proven very effective. By using the Lambert sight in a novel way it is comparatively easy to find a practicable point-of-aim under any given set of conditions.

Figure 65 illustrates a most effective method of using this contrivance at 100 yards. Here we do have a fairly convenient background on which to set our pointer.

The sight-fixture is left in the usual position, only the pointer has been reversed, so it protrudes from the *right* side of the bow, or opposite the arrow-plate.

In employing this sight at the long ranges the pointer is set by first taking up the bow and locating the position of the natural

point-of-aim with the arrow placed in drawn position. Without moving the bow we now look to the right side of the handle and locate a convenient reference-point that lies in the practicable view.

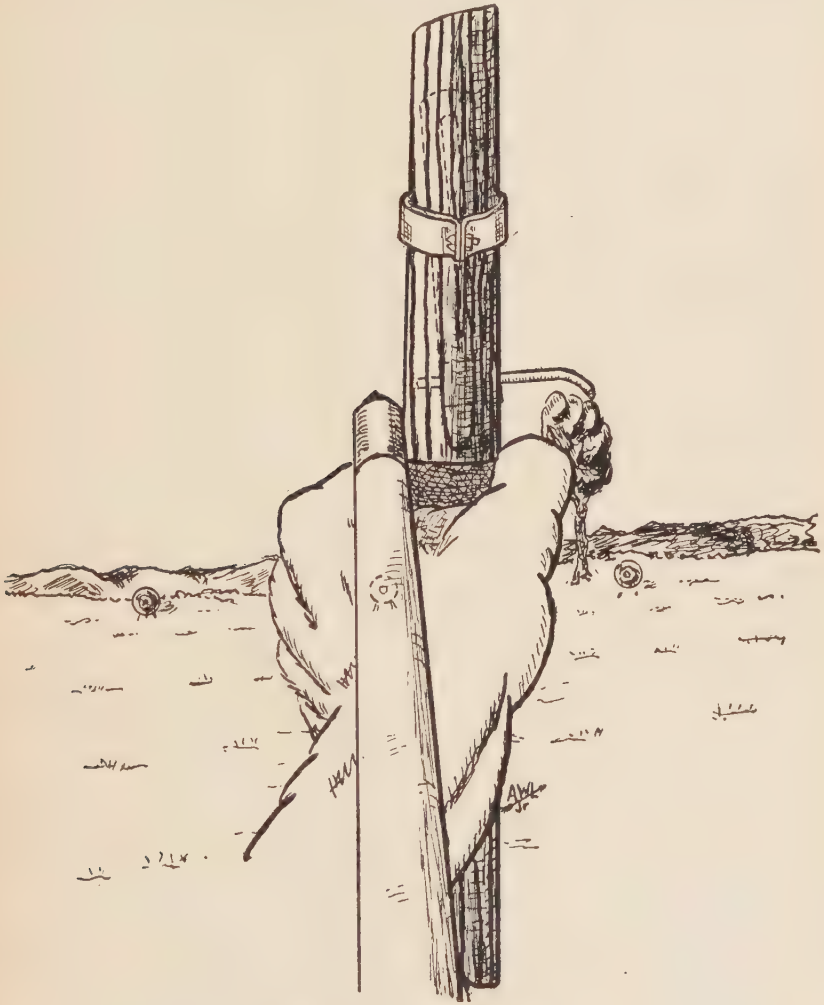


FIG. 65. THE LAMBERT SIGHT
Indirect Aiming at Long Range.

If we find such a point, preferably a well defined fork in a tree, insulator on a telephone pole, or corner of a house, we estimate the position of the pointer and set it to sight on the aiming-point

so chosen. If possible this aiming-point should be clearly distinguished, sharply defined, and as far away as possible. An arrow is

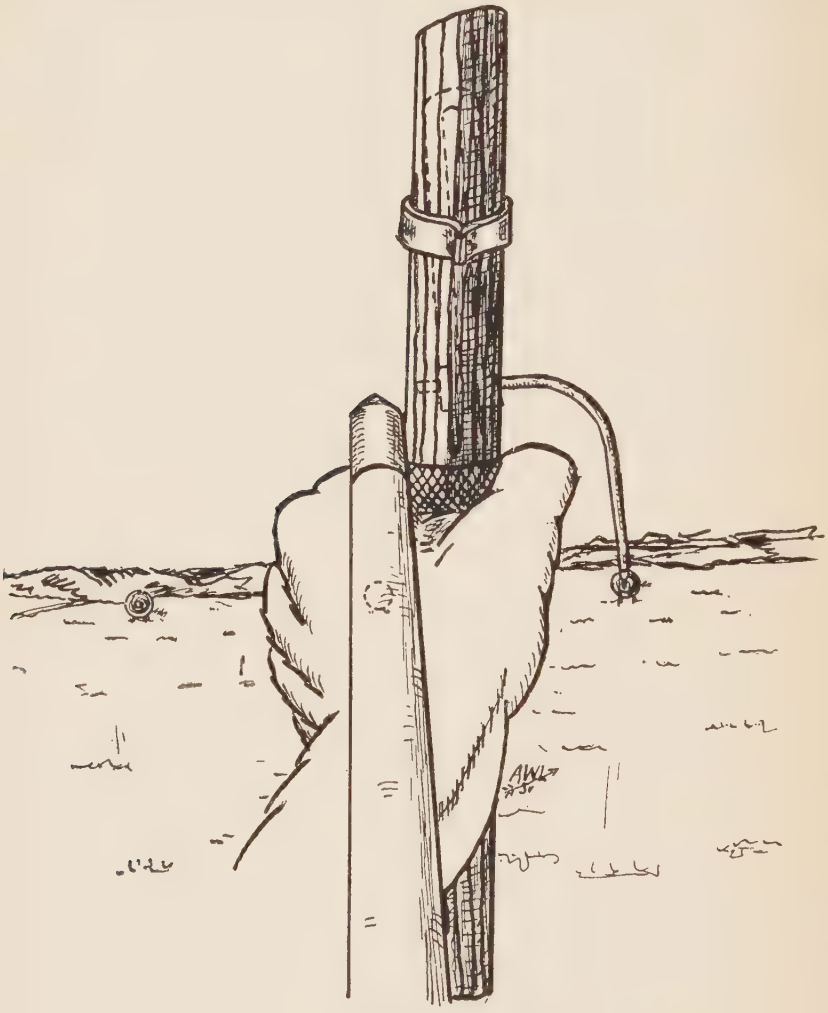


FIG. 66. THE LAMBERT SIGHT
Difficult Setting for Long-Range Aiming.

now shot, and its flight noted. The sight is then changed to bring about the required correction.

In making the initial setting care should be taken to see that the range-slide is truly horizontal when the bow is held for shoot-

ing. Any right or left changes can then be made without interfering with the range-setting, and *vice versa*.

While aiming the target itself is unseen. Yet if the technique of the shot is correct the arrow will go where it is pointed, although the eye itself is fixed on an entirely different object.

We personally prefer to use the pointer in the position as shown in *Figure* 65, since the focus of the aiming-eye can be easily switched between the aiming-point and the pile of the arrow.

In shooting by this method great care must be taken to check the length of draw and the position of the pointer before loosing. The shooter should take care to stand in precisely the same position for each shot, unless the aiming-point is in the far distance, when a variation of one or two feet to one side or the other makes little difference.

AN EMERGENCY SETTING

In *Figure* 66 we see the same method illustrated, except that the pointer is set on an object practically on the ground. Sometimes it is necessary to so locate the aiming-point, due to lack of a suitable background with convenient points on which to make a setting. The principal disadvantage of such a setting lies in the ease with which the longer pointer can be jarred from its proper position. Any movement of the pointer from the correct setting, due either to jar from the recoil of the bow or from careless handling between shots, will destroy the aim.

The sight may be clamped beneath the handle if necessary. However, it is always advisable to sight on a distant object. Any awkward position of the pointer is dictated only from the necessity of overcoming exceedingly difficult conditions.

Many archers have hitherto made use of the general principle of indirect-aiming in attempting to point their shafts with some degree of regularity at 100 yards. Some make marks on the sleeve or bracer, and aim by putting that mark on a convenient object seen over the forearm. But this is far less effective than a definite and sharply defined fixed point on the bow itself.

AIMING-RINGS ON ARROWS

Some archers paint rings or dots on their arrows about eight inches from the pile, and raise the bow-hand until the Gold is be-

hind the proper ring. The writer has employed this method with fair success. He draws with the arrow pointed decidedly to the left of the target, so the target can be seen to the right of the grip. Only the right-eye is used, and the elevation obtained by bringing the ring even with the Gold. The bow-hand is then moved to the right until the Gold is estimated to be in line, and the arrow loosed. This is the opposite from drawing to line first, then raising the arrow. Both methods require that at least one element be judged by estimation to an appreciable degree.

Other archers make use of both eyes, employing what Dr. Elmer terms "Paralyzed ocular accommodation, or, in other words, by looking at the distant target but not at the close ring" so that "both the target and ring can be seen at the same time and accurately adjusted toward each other." This is a most difficult thing to do, and is very hard on the eyes. The writer, if he must use rings, prefers the former method.

THE BOW-STRING SIGHT

A still different sighting device is a small peep-hole or even a knot of string that slides up and down on the bowstring itself. This can be adjusted and used after the manner of a rear-sight. By aligning the point of the arrow, the target and this sliding rear-sight, the method of aiming is similar to that of a rifle. Like all other sighting devices it can be used with some degree of success by competent archers; but it has always been discarded in favour of the regular method.

ACCURACY OF INDIRECT-AIMING

Compared to the normal, or direct method of aiming on a point-of-aim, the off-set method as shown in *Figures* 65 and 66 is by no means an easy one to master. It involves differences in technique and introduces several additional factors. However, *it works and is entirely practicable.* It is particularly valuable for archers who wish to use weaker bows and can find no satisfactory point-of-aim by ordinary methods.

The accuracy possible with the Lambert-sight is attested by the fact that one afternoon in the fall of 1927 the writer settled down to a run of twenty-seven consecutive hits at 100 yards while shoot-

ing on the Forest Park range. Then a sudden storm blew up and made further accurate shooting impossible.

This shooting was done on the only occasion that the writer ever managed to shoot on a calm day, as the range on which he shoots in practice is on high ground and always windy.

This excellent run of hits came between the third and eighth ends of a 55-269 score for the seventy-two arrows.

The one particular arrow that was used as our **base-arrow** for aiming registered for its individual score during these eight ends a **Red, Gold, Gold, Gold, Black, Gold, Red,** and **Gold**—a total of eight hits for **62 points.** The lone black was due to a poor loose and was called before the arrow left the bow.

Had the thunderstorm which blew up to make aiming practically impossible during the final four ends delayed a few minutes longer, it is probable that the score for the 72 arrows would easily have exceeded 300 points, and might have gone on for a score in excess of 700 for the Single York Round.

Of course, it is the *might-have-beens* that help make archery interesting! However, we report the result of that afternoon's shooting at one hundred yards, not so much to chronicle a personal achievement, but to give evidence of a first-hand and convincing nature of the sound practicability of the indirect-method of aiming with such a sight.

On the other hand, in the 100-yard shooting of the second York Round at the 1928 National Tournament, shooting in the rain and with a slight wind that blew over the Polo Field of the Westchester-Biltmore Country Club at Rye, we made a similar score of 49-229 with a run of sixteen straight hits—using the regular method.

SIGHTING WITH LEFT-EYE AT 100 YARDS

If moderately strong bows are used, so the natural point-of-aim is not over two or three target-diameters above the **Gold** at 100 yards, the Lambert sight may be used for direct aiming at the **Gold** itself. To accomplish this, the pointer is reversed from the position shown in *Figure* 66, so it projects from the left side of the bow, and the *left* eye is used to aim with.

In the last analysis the question of using sights boils down to the ability of the archer, the exigencies of the case, and whether it is convenient or not to use one.

CHAPTER XXXI

RECORDING THE POINT-OF-AIM

It is advisable for an archer to record in some permanent manner the locations of his different points-of-aim. This is a valuable habit, especially if he hopes to compete successfully in tournaments or wishes to turn in particularly good practice scores.

Practice shots are not allowed between distances in the various rounds!

Once begun, the total number of arrows called for in any particular round is supposed to be shot in consecutive order.

If an archer be desirous of making a legitimate high score every arrow must count. And no shots are apt to be lost at the first ends of every change in the shooting distance if an archer has confidence beforehand in the proper location of his point-of-aim.

A record also saves time and trouble for the archer who habitually shoots on the same range. It is only necessary to locate the proper mark once. After that the note-book will serve as a reminder and there will be little necessity for preliminary shooting before the actual shooting begins.

The "natural point-of-aim" should always be located, whether it or a sight on the bow is used.

SIMPLE POINT-OF-AIM OR RANGE-RECORDER

The simplest method of recording a point-of-aim is to mark it on a thin piece of wood, about five inches long and half an inch wide. The surface should be planed smooth and a hole bored in one end, so it can be strung on a loop of string, like keys on a chain, to keep it from getting lost.

One side should be used for short-range points, the reverse being used for long-range positions.

In *Figure* 67 (A) shows the 40, 50 and 60-yard marks, and (B) the marks for 60, 80 and 100 yards. The position of the latter two are usually above the mark for the Gold, whereas the others are usually below.

The range-recorder is used as shown in *Figure* 68. The arrow may be used as a gauge to place it always at a uniform distance from the eye.

The left-eye is shut and the range-recorder is brought into a vertical position so the arrowhead mark is sighted just beneath the *Gold* of the target. While carefully held in this position the eye runs down the side until the point-of-aim is seen. Its position is then noted with the thumb-nail until a pencil-line can be drawn to record the place and note the range for which this particular mark is intended.

Once the position is thus recorded it is only necessary to reverse the operation to set out a new point-of-aim at approximately the right spot at any later time or on any other range the archer may find it necessary to shoot.

If different bows and arrows are used, range-recorders may thus be made for each combination.

A much simpler device is a common ruler marked off in inches and eighths of an inch. A note-book must be kept, however, and the positions marked, care being taken to note whether they be above or below the Gold.

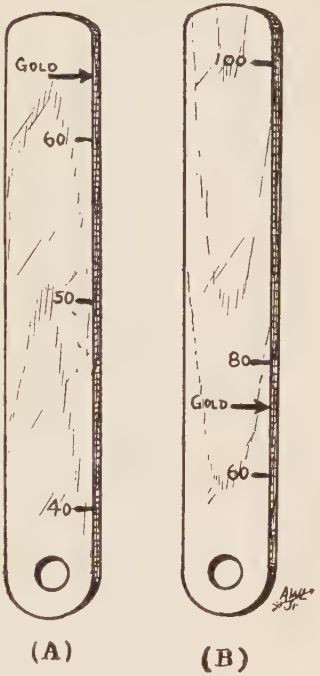


FIG. 67. RANGE-RECORDER
(A) Short Range Side.
(B) Long Range Side.

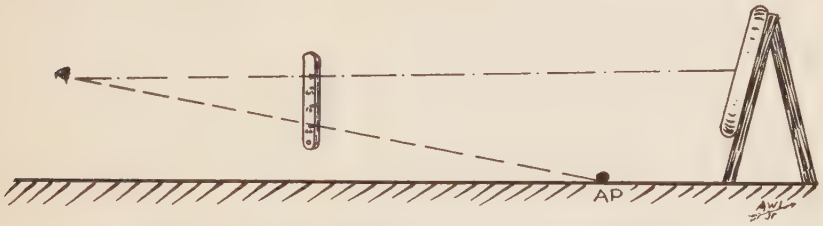


FIG. 68. LOCATING POINT-OF-AIM WITH RANGE-RECORDER

As a matter of convenience the writer scales off quarter-inch divisions on the left side of his bow above the arrow-plate. The half-inch divisions are numbered with steel dies. This marking as

shown in *Figure* 69 eliminates the necessity for having another ruler at hand, and is particularly convenient for checking settings of the sight.

In so marking a bow take care not to cut too deep into the wood

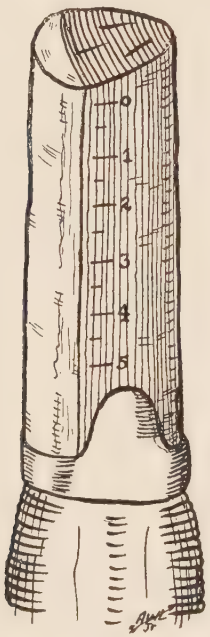


FIG. 69. SIGHTING-SCALE MARKED ON BOW

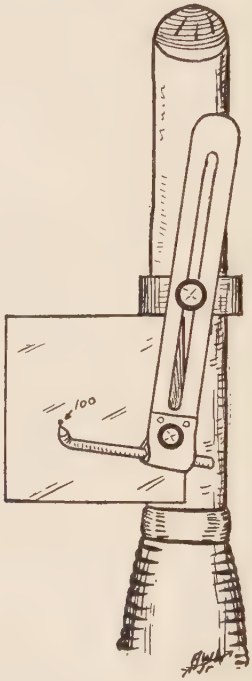


FIG. 70. CHECKING OFF-SET SIGHT SETTING

—or into the back—otherwise you may encourage the beginning of a splinter.

The **Zero** line should be at approximately the right setting for locating the point-of-aim for 40 yards, the minimum distance usually shot.

When the off-set type of sight is used in indirect-aiming the pointer-setting may be easily disarranged. It is important to keep an accurate check on the setting. This can easily and conveniently be done by laying a blank card along the center-line of the bow, as shown in *Figure* 70, marking the exact point of the setting with a dot.

Remember that such practices and devices apply mainly to the

ultra-serious archers who are interested in more than a sociable afternoon of mere pleasant exercise and sport. However, the high scores, such as 600's for the American and York Rounds, are only made by archers who have perfected their technique to a high degree and who do tend carefully to every little detail.

And the ability to make consistent high scores, rather than an occasional high one that results largely from luck, comes with that mastery of the art that only proper study and application can give.

LOCAL BAD HABITS

An archer who habitually shoots on the same grounds learns his points-of-aim and gets into the habit of spotting them subconsciously. Or he learns, say that for forty yards its location is some set distance in front of the target, etc. . . .

Archers who rely on such methods seldom perform well on strange grounds, particularly at competitive matches or tournaments, where they must cope with strange conditions.

Distances on strange grounds are usually most deceptive.

Besides, a point midway between the shooting-line and the target may be several inches lower on one range than on another, so that a point-of-aim set out by measurement on the one may not be properly set by the same measurement on another.

It is easy to acquire the habit of shooting always at a favourite target. It is also easy to "dig" foot-positions on the home grounds that accustom the archer to a familiar feel.

But it is better to change the position frequently, and to visit as many strange grounds as possible. This practice helps make an archer the master of the situation under varied circumstances, and helps him get out of a rut at times when his shooting slumps.

CHAPTER XXXII

THE STRATEGY OF ARCHERY

Scientific archery can be divided into two general divisions, **Technical** and **Strategic.**

When the individual archer has so mastered the details of Aiming, Holding and Loosing, etc., that he is master of the weapon in hand, minor details no longer concern him as matters of prime importance. He must do everything connected with the mechanical department of shooting subsconsciously.

Then the **Strategy** of the game becomes his chief interest.

He must reach the condition when he knows that *he* is right or wrong with every shot. He must be absolute master of himself and be able to differentiate accurately between his own mistakes and to misses chargeable to faulty equipment. Archers too often blame their tackle when they make poor scores. On the other hand a great many blame themselves for bad shots that are really the fault of their arrows.

Fine equipment will improve any archer's score to some extent. But the mere expenditure of money will not make an expert of a dub.

The **technique** of archery relates to the archer himself. It ceases directly the arrow leaves the bow. The **strategy** of archery relates to extraneous influences that must be recognised, appraised and compensated for.

There are times when an archer is off-form and cannot hit the proverbial "balloon." This occurs in any line of endeavour, particularly sports. However, when an archer is **right,** if he is an expert he ought to make a central hit on the target with every shot at distances of 60 yards or less, and comparative hits at the longer distances.

The only reason for a miss or an outer hit at the short ranges should lie in the archer's inability to judge the correct location of his point-of-aim.

At the longer distances external forces have greater proportionate influence and more accurate judging is necessary.

Each and every arrow has individual characteristics of its own. Each one must therefore be aimed differently from the rest if hits in the Gold are to be consistently gathered.

Furthermore, variations between the different arrows of a set are constantly changing. Slight injuries may cause arrows to fly off several inches or feet from their accustomed courses.

At the longer ranges, variations in the intensity and direction of the wind must be sensed and allowed for. At tournaments the writer watches tree-tops, chimneys and any other indications of wind conditions. He also watches the flights of other archers' arrows, particularly the angle at which they fly,—and has gotten many extra hits by allowing for drift that others failed to note.

Wind plays a minor part at the short ranges, unless it is exceptionally strong. Its effect on shafts shot from a fairly strong bow is not so important.

A head-wind is easy to allow for; but a tail-wind is often most puzzling. It assists the first part of the flight at the long range; but after the peak of its trajectory has been reached and the arrow points down, the wind not infrequently tips up the feathers and causes a most exasperating dive just before the target is reached.

Temperature also plays an important part. So do a number of other more or less important external influences.

The question of good or bad shots thus is directly proportional to the good or bad judgment used in estimating and correcting for them.

To minimize the necessity for dealing individually with each arrow an archer, naturally, should use arrows that are as nearly alike in flying-qualities as possible.

ARROW GROUPS

We can best understand the arrow situation by considering what is termed the group of a set of arrows.

If we assume that a number of arrows have been perfectly aimed and shot, having all been sighted on precisely the same point-of-aim, we will find that these arrows hit the target in a more or less circular pattern. Some will be high, some will be low. Some will be right and some will be left. No matter how many times they are

shot, if the technique and other conditions are the same throughout, each arrow will hit at the same place each time. So that the diffusion of the group, or spread of the hits, is a fairly constant pattern for any given set of shafts.

If a set of arrows group close together it is a good set from a shooting standpoint. But if the arrows fly in considerable dispersion it is a poorer set, and more difficult to shoot with and make good ends.

Any single arrow that leaves the bow for a clean straight flight is a good arrow. But to obtain six that group well on the target is another matter.

Experienced archers usually purchase their arrows by the dozen. They then try them out and sort them into groups that act alike, usually putting aside the best ones for special occasions. For ordinary practice the wide-fliers should be used. So long as they do not zip or zoom or flirt in an unreliable manner, they will yield good results with proper compensation.

Occasionally an arrow will be found that acts in a mysterious and temperamental manner all its own. Such arrows are termed "Prima Donnas," and are the plague of an ambitious shooter.

Matched arrows, target-tested arrows and other assortments of supposed superior quality have been discussed in the chapters on arrows. But we still contend that the only real test of a set of arrows lies in actual shooting by the archer himself. And with different archers, different groups to a large extent can be expected of the same shafts.

We are, of course, discussing the matter of arrows and groups from a more or less academic standpoint. Few archers are capable of getting anything like the best expectable results from a perfect set. However, by recognising the basic principles of the art and keeping these in view we do temper the quality of our shooting for the best.

Not only has a set of arrows a group or pattern; but each archer himself has one. In other words, if he had six shafts that did fly exactly alike, his own errors would form a "pattern." This is really reflected in his score! And before particularly fine arrows can be of much value, the archer must have so improved in his own ability that his personal grouping is close.

The target- and flight-tested arrows that are being supplied of late are a great step in the direction of reliable shafts, in spite of

any lack in ultimate perfection. They at least give the new shooter a much better set of projectiles than he was able to obtain previously.

Unknown individuals often turn in exceptionally high scores once or twice during their lives—then never approach this mark again.

We believe that when they were shooting such exceptional scores they were using arrows that happened to be exceptionally good in making a small group, but as one by one of these shafts got broken or damaged and were replaced by others the archer neglected to learn the individual differences and continued to shoot in the same old way.

Keeping track of six different arrows and six different points-of-aim is no easy task. It is hard mental work, and requires concentration. But rightly expended it will make for much higher and consistent totals.

PSYCHOLOGY IN AIMING

When we begin to allow for individual differences in the flights of arrows we run into another difficulty. We may term this "**The Psychology of Aiming Allowances.**"

It is easier to talk about making allowances for individual vagaries in arrows than it is to actually make these allowances.

We can shoot an arrow time after time at the regular point-of-aim, for example,—and see it make a flight high and to the left.

So the next time we shoot this arrow, we allow for this and shoot it with aim altered a bit *low* and to the *right . . . and to our disgust see it go exactly where we aimed it!*

We can repeat these performances time after time with nearly always this same result.

The explanation of this phenomenon lies in the psychology of the archer. Usually he *thinks* that he has made the proper allowance—but before the loose he has involuntarily lost confidence in his judgment and in spite of good intentions really shoots as he did before. On the other hand, he is so intent on making the necessary correction that he overemphasises some other little detail. He may put just a little more draw behind the shaft, make his loose a wee bit livelier, or grip his bow with a slightly more determined hand . . . whatever it is, it nullifies the correction and the shaft flies *apparently true.*

The novice should practise altering his aim with single arrows, or with arrows that do group the same, until he overcomes flinching and drills his determination to allow, stick to the allowance, and not make a change in anything else.

The writer has seldom shot with the same bow and arrows over extended periods of time, consequently may be said to have used a new outfit nearly every time he shot. This was particularly true of arrows. This has been a handicap in a way, but it taught him to adapt himself and his shooting very quickly to new conditions.

With arrows it has been our custom to take a dozen or so shafts and shoot these on some definite point-of-aim. The six or eight that group the best are then selected and shot during the afternoon.

Very soon the grouping of the individual shafts are learned and the arrows shot in rotation, so these different characteristics can be easier remembered. All arrows are, of course, numbered for reference.

One of these arrows, usually the one that makes the most central hit, becomes the **base-arrow**. It is always shot first and with the greatest care. On its performance we base the aiming of all the rest, allowing properly for the individualities of each.

INITIAL-JUMP

The deflection of an arrow, unlike that of a rifle bullet, is not proportional to the distance. In other words, if an arrow fly *one* foot to the left of the **Gold** from fifty yards it will not necessarily fly *two* feet to the left from one hundred, assuming that the direction of aim is perfect in both cases. This is because of the **initial-jump** of the arrow as it leaves the bow. This jump is the same at all ranges and is sometimes sufficient to throw a fairly good arrow completely to the side of the target at forty yards. Therefore, in allowing for right or left differences care must be taken to differentiate between the jump of the shaft and true angular deflection.

In aiming a **left-flier** slightly to the right, it is often wise to move the right heel slightly back and pivot on the left. This brings the entire body into the new line, rather than a simple movement of the bow-arm alone.

Changing bowstrings also affects the flights of arrows. A light

string livens the cast of a bow. A heavy string deadens it. And the group made by the shafts in the one case may be different from that of the second.

THE SCORE-SCHEDULE

Target-shooting is far more interesting if the archer sets a score-schedule and tries to keep to it.

The writer always tries for 42's at forty yards. This means an average of seven, or Reds, for every shot. If a Gold is made—two extra points are obtained. If a Blue, or five, is made, a Gold must be made to balance the loss. A Black, or three, requires two Golds to bring up the average.

If an end falls below the scheduled 42, the next end must result in a 44 to bring the score back on schedule.

At 100 yards we aim to average 16's and do everything possible to keep from falling below this score for each end. This will give us a score of 192 for the seventy-two arrows, and but eight additional points makes the greatly desired 200!

Shooting in this manner gives the archer shooting alone competition against himself. A single American Round shot in this manner is of far more practice value than three times the number of shots loosed without having kept a score.

A complete record of all scores shot is of great assistance in studying one's progress. An archer should analyse the result of every performance. He will accomplish more if he sets himself a certain task to accomplish, then plans and works until this goal is reached.

If every shot is recorded, as shown in *Figure* 38, the archer can review his score-card when he gets home, and plan to correct the mistakes he made that day when next he shoots.

After shooting his first American, York, or Columbia Round the novice should dig into the records of other archers and see where he stands on the list. He is not apt to be on a par with those at the top, nor is he likely to be so poor as those at the bottom. But he at least starts his climb up the score-ladder from a definite rung. He should then set his immediate goal at a mark some fifty or one hundred points higher, and work until he has attained this objective.

NOCKING

DRAWING

AIMING

PLATE VII

Mrs. Dorothy Smith Cummings,
BROOKLINE, MASSACHUSETTS
National Champion, 1919, '21, '22, '24, '25, '26

PRIVATE PRACTICE VS. TOURNAMENT SCORES

An archer seldom makes his best scores at a tournament. Often he cannot even approach in public the best scores made in private. However, his tournament shooting does vouch in a way for the correctness of his score reporting. The ones who know can usually size up the reliability of archers sending in high totals. An archer addicted to questionable methods, such as one who habitually gives himself the benefit for all close decisions, or who reports composite scores instead of consecutive arrows, or who extracts the best ends from a number shot, *is soon found out*. On the other hand, the leading archers of proven ability are most scrupulous and exacting in adherence to the regulations, and once this confidence is established their reports of high scores are accepted without question.

In private practice an archer naturally chooses conditions at their best. At a tournament he must shoot on schedule and take conditions as he finds them.

In a formal match he is also conscious of shooting under strain.

Tournament scores, therefore, except in a general way, are not indicative of an archer's real top abilities.

At a tournament he is nearly always under some disadvantage, and the shooting is a contest of *nerve, resourcefulness* and *endurance,* as well as of pure skill. If the tournament shooter gets off to a bad start there is no starting over, and nothing less than a heavy rain is apt to interfere with the program.

One of the greatest tournament shots of the present day is Andrew L. Brush of Cos Cob, Connecticut. Brush seldom makes very high scores in practice; but he is exceptionally steady in a match affair. In the past four or five years he has seldom failed to rank lower than second or third whenever he shot. His 223-1029 gave him first place for the Double York Round at the 1928 National Tournament.

MAIL TOURNAMENTS AND MATCHES

Tournaments by mail are interesting and stimulative to the best efforts in archery.

Each archer shoots the required rounds on his home range and sends in his score to some central headquarters. A final date for

receiving the scores is set, and the archer can turn in a score that represents his best shooting effort within that time.

If a time limit, rather than the requirement that shooting be done on a particular day, is the rule, an archer can pick a good day and send in scores that will be on a par with his best ability. In this manner an archer may shoot several different scores and is privileged to have his best count.

The principal stipulation in such a tournament by mail is that all rounds be shot in strict accordance with the established rules, and that a round must consist of the proper number of shots *loosed consecutively from beginning to end!*

The National Archery Association publishes a frequently issued *Bulletin* in which practice scores from archers throughout the country are listed. Since these scores are listed in order of rank the *Bulletin* is virtually sponsoring a continuous tournament by mail.

The scores in *Chapter* XXXVII give the record scores for the important men's and women's rounds, also the numerical rank of archers for these rounds according to the highest published score in that round for the year 1928.

The novice is urged to use this list as a "thermometer" for judging his own efforts.

CHAPTER XXXIII

INDOOR ARCHERY, NIGHT AND NOVELTY SHOOTING

In some fortunate sections of the country outdoor sports can be engaged in the year 'round. But in the larger part, the coming of fall heralds an end to these recreations.

Archery is essentially an outdoor sport and hitherto the archer has hibernated with the rest of his fellows. The winter has been spent in making new bows and arrows or in repairing his tackle for the coming spring.

The enthusiastic archer, however, can shoot all winter if he has a mind to. Clubs in different localities have engaged armories or large halls during the cold weather for practice at the regular rounds.

After much experimenting to find a satisfactory system of indoor shooting the writer and a few friends devised a plan that has met with practical success. It has worked satisfactorily with several clubs and at a number of schools where archery groups met once or twice a week to shoot. And for the past two winters successful indoor tournaments have been held in local Y. M. C. A. gymnasiums, with about thirty contestants shooting.

In many regions the weather is uncertain during early spring and late fall. And archery classes in schools find it difficult to rely on an outdoor program. For such groups an indoor schedule is strongly recommended. This is independent of the weather, and may be scheduled for day or night.

The whole indoor plan is based on the idea of reducing all measurements to a one-third scale. A miniature target, 18 inches in diameter, is used in place of the 48-inch standard. Except for size, it is exactly like the big one. And the distances from target-line to shooter are measured in feet instead of yards.

The same rounds are shot as out-of-doors. Thus an "Indoor Columbia Round" would consist of twenty-four arrows shot respectively from 50, 40 and 30 feet, and an "Indoor American

Round" would be thirty arrows shot similarly from 60, 50 and 40 feet.

THE INDOOR TARGET

A most satisfactory butt is a single bale of hay. This should first be wrapped neatly with heavy wrapping-paper, glued at the seams. Around this a layer of dark bunting is sewed.

Do not use burlap or other coarse cloth, or you will have excessive rebounds!

As the bale is not square, drive pegs where needed in the base to keep the bale standing in an upright position.

The target-face is painted on a rectangular bit of oilcloth.

Paint the area outside the white a dark colour to harmonise with the covering of the butt, and pin the face in place at the four corners with safety-pins.

This is a most inexpensive and efficient target. It is far superior to a small circular boss, since the centre of the target is not so easily shot away, and the large butt catches and stops nearly all arrows that miss the face itself.

THE INDOOR BACKSTOP

To prevent damage to arrows that do fly wide, a **drop-curtain** is hung directly behind the butt. This need be but six feet high and about eight feet wide. A wider drop, however, will suffice for two targets.

Make the **drop** of tough cloth. A carpet will do if nothing else is available. A splendid drop can be made from mattress ticking, pleated at the top and allowed to hang in loose folds. No matter what material is used it should touch but not drag on the floor. *It should give when hit!* Otherwise an arrow will go clean through.

A single drop-curtain will stop almost any arrow; but a second drop placed about eight or ten inches behind the first affords almost perfect protection.

The backstop as thus described should be at least two feet from the wall. The archer has little care for the wall, if the truth be told; but he *is* particular about the safety of his arrows!

The **butt**, **target** and **backstop** as thus described is shown in *Figure* 71.

The lighting problem is easily solved. Two incandescent lights of about 100-watt power behind ordinary tin reflectors give all the illumination necessary on the target. There should be sufficient indirect light on the floor for the archers to see their points-of-aim.

Although distance is lacking on such an indoor range the scores made at the indoor rounds are remarkably close to the respective scores made outside under standard conditions.

At forty *feet* the small target looks exactly like the big target at forty *yards!* So the illusion of aiming, so far as appearance of

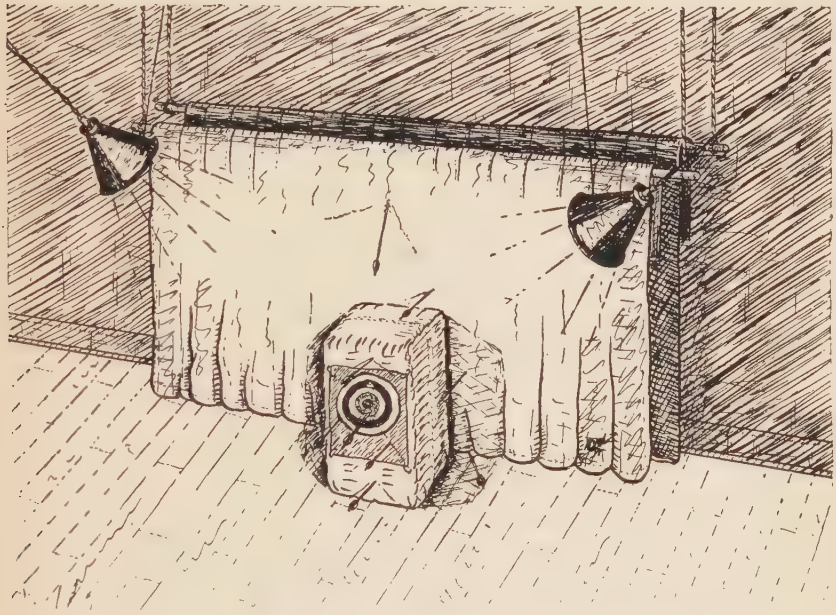


FIG. 71. TARGET, BUTT AND BACKSTOP FOR INDOOR RANGE

the target is concerned, is precisely the same. However, since comparatively weak bows will carry fairly straight at indoor distances, the points-of-aim indoors are nearly always below the target.

It would seem that hits are easier in proportion indoors than out, due to the comparatively low flights of arrows and all absence of wind. The relative difficulty in hitting the target *face* seems to be about the same; but hitting the Gold was apparently more difficult indoors.

We came to the conclusion that the jump of the arrow as it leaves

the bow—which is slightly different with every arrow, and causes a parallel rather than true angular deflection—was greater in proportion to the miniature Gold than at the large Gold outdoors. This jump nullifies to a great extent any gain in advantages due to the much shorter range and freedom from other external influences.

We strongly recommend such gallery practice for beginners. It is far easier to teach the rudiments of archery indoors than out. For one thing arrows are not lost or strewn over a large area—a most disconcerting bother when starting to teach new archers.

Archers of ordinary ability can use their regular arrows. Better shots, however, can well afford to use their cheaper ones, as the smaller groups bring feathers close together and there is more likelihood of hitting or splitting other arrows.

We found it very pleasant to shoot a bow of about 38 pounds pull. Heavier bows, however, cause the arrows to tear into the butt with too much force for comfort. An archer who is habitually used to a stronger bow, however, will lose nothing from a season of this indoor work with a weak weapon. He will be obliged to pay more careful attention to the delicate art of careful loosing. As mentioned on *Page* 75 the present National Champion attributed his machine-like regularity of loose at Rye to having practised earlier in the spring with very weak bows.

INDOOR ARCHERY RANGE LOCATION

For such indoor archery almost any hallway will serve. If this hallway or other room be 75 feet long there is ample distance for spectators, shooting-line, target and backstop to shoot the full "Indoor American Round."

The principal advantage in conducting indoor work on a gallery basis, over an attempt to conduct regular out-of-door style of shooting under a roof, lies in the availability of ranges.

Armories or other large structures, in which ample distances for the orthodox rounds may be obtained, are usually hard to light and exceedingly cold. Such places, if well lighted and heated, are expensive. On the other hand many school buildings and churches now encourage meetings of outside groups in the evening—particularly groups composed largely of parents of their pupils. And for these meetings ample light and heat are usually provided at little or no expense.

The archers of Webster Groves, Mo., for two seasons, met one night a week in the basement of a nearby public school. Several targets were placed in a large empty room where thirty- and forty-foot distances were obtained. A fifty-foot range was then put in one long outside corridor, and a sixty-foot range located in another.

All archers belonging to the club were required to shoot at the thirty-foot distance—in the particular room set apart for that target—until they turned in an official score of 100 points with the regulation thirty arrows. Ladies shot the same rounds as the men.

When an archer qualified with an official score of 100 points, he then shot at the forty-foot target. A 100-point score from forty feet entitled him to go to the fifty-foot target, and a like qualification there entitled him to shoot at the sixty-foot range.

Thereafter fully qualified archers regularly shot a double Indoor American Round on each occasion.

These rulings as to qualifications were found necessary for disciplinary as well as competitive reasons. In the beginning many beginners insisted on shooting at marks they could not possibly hit. So definite rules were established and all archers were required to shoot from the shortest distances until they could qualify for the next. This rule put the newcomers where they belonged and made them earn the right to progress. Likewise, those archers who had attained the right to shoot the regular rounds were usually serious and wished to concentrate on their shooting, and the qualification rule served admirably to keep the overly sociable dub from interfering too much with the former's game.

SMALL AND PORTABLE TARGETS

For outdoor practice in small yards shooting on a proportionate scale between distance and target-size is recommended. The full sixty yards required for the American Round is seldom available in the immediate surroundings. Likewise, a standard four-foot target is almost impossible to tote around.

A three-foot target of regulation style is the largest size for practical portability and can easily be carried in an automobile.

In shooting at such reduced targets the standard distances should be reduced to proper proportion. If a three-foot target is used, reduce the distances to three-fourths of the regular requirement.

If two-foot targets are used, make the reduction in distance to one-half.

This practice is, of course, not the same as the "real thing," but such proportionate shooting will give the archer who has to practise in a cramped space some idea of what he can do under regulation conditions. He can at least practise at home on week days and visit the club on Sundays and holidays to make his official scores.

But if full-length ranges are available and an archer simply desires a portable target, as suggested on *Page* 152, it is better to paint the rings full size—omitting the outer ones of lesser value.

TARGET PROPORTIONS AND SHOOTING DISTANCE

It is erroneous to think that any reduction in the distance that a smaller target is shot at should be in proportion to the relative *areas* of the two target sizes. In other words, if we shoot at a two-foot target instead of a four-foot one, we use a target with but one-fourth the actual area involved . . . so in shooting at the two-foot target we should shoot from *one-fourth* the regular distance —if the reduction of range was calculated on an *area basis*.

However, a glance at (**A**), *Figure* 72, will show that the simple linear proportion is correct. Although an error in aim may be made in two dimensions, the actual optical illusion is the same at all proportional sightings, and once the arrow has started its flight it diverges from a fixed centre in proportion to the distance of the centre from the starting point.

In (**A**) we assume that the distance of flight is small so that the arrow flies in a comparatively straight line through both distances. We see that under such conditions an arrow shot to pass through the Gold, *or any other spot,* on the one target, will pass through the same relative spot on the other target—if the two are in direct proportion as to diameter and distance.

Of course, the shafts do not fly in a perfectly straight line, but take curved paths, as shown in (**B**) of the same figure. But at ranges of sixty yards or less for men and fifty yards or less for women, the difference between the straight-line flight and the true trajectory is comparatively small, and not sufficient to warrant any change in proportions other than those proposed.

Comparing the indoor miniature target with the outdoor regula-

tion target: the larger target, placed at the farther distance, will, of course, be harder to hit on account of outdoor influences; but this advantage at indoor shooting is largely nullified by the initial-jump of the arrow. The closer and narrower the rings on miniature targets, the more apt is this initial-jump to carry a hit into a lesser ring on the closer but smaller target—in spite of the fact that the distances are proportional. To test this assertion, the archer who

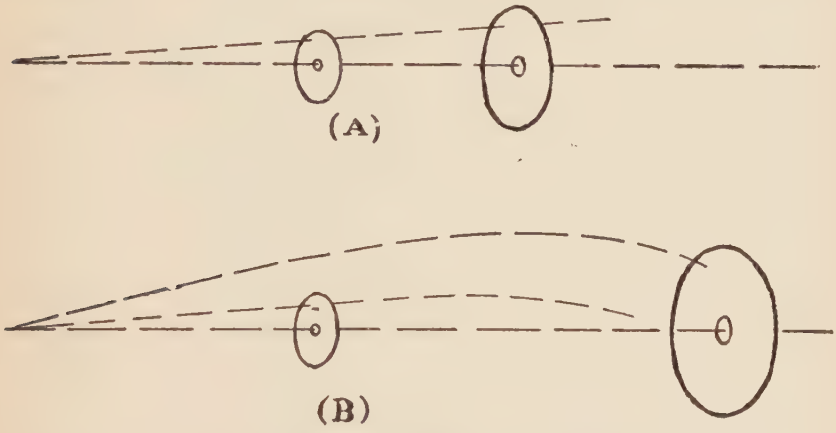


FIG. 72. TRAJECTORIES AT SHORT AND LONG RANGES

(A) At short ranges the divergence from the *Gold* is practically in linear proportion to distance from target.

(B) At long ranges the divergence is not in proportion to distance from target.

can consistently hit the Gold of a standard four-foot target at forty yards, is invited to try hitting a circle 8/10-inch in diameter from ten feet.

ARCHERY AT NIGHT

Outdoor shooting at night is entirely practicable.

Many archers have private ranges in their own yards, but get home from business too late to indulge in daylight practice. By throwing a good light on the target from a single incandescent bulb held in a good reflecter there is no sacrifice of visibility due to lack of daylight. If the archer uses a sight he can aim directly at the Gold. If his point-of-aim is on the ground, a little illumination thrown on it from a light or lantern is all that can be desired.

The writer has shot on numerous occasions in his side yard—on a pitch-dark night—with only a small lantern on the ground at the point-of-aim. Once this was properly located hits from any

distance up to sixty yards were comparatively easy, and some remarkable groups resulted. This method is unsatisfactory, though, since the result of a flight cannot be observed until the target is visited and no corrections can be made between the shooting of individual arrows.

NOVELTY EVENTS

An interesting match similar to playing golf for holes can be played by two or more archers. Each shoots an end of six arrows and on pulling the hits the archer with the high score adds the difference in score to a previous total. The archer getting a certain set number of extra points first wins.

Shooting at toy balloons is a never ending source of amusement. Balloons inflated with air can be tied to hang from a string stretched between two trees. Shooting at these exploding targets lends zest to any afternoon of archery. If the balloons are inflated with gas, and anchored to sway freely in the breeze at various heights, the difficulty in hitting them is greatly increased. But unless there is plenty of room and *no unprotected spectators,* it is not advisable to shoot at balloons floating high in the air.

Instead of standard targets, figures representing animals can be used, and hits scored according to the part struck.

In the wand-shoot, a lath, one inch wide and six feet long, is stuck upright in the ground and shot at from 100 yards—sixty yards for women. A given number of arrows are shot and the greatest number of hits decides the winner. At the National Tournament a "wand-shoot" is obligatory. However, to save time, a one-inch vertical zone is marked down the middle of each target, to represent the "wand." Hits that touch this area are marked on the score-card with a ring. The greatest number of these so-called "wands" during the 100-yard shooting decides the event. Thus two separate contests are staged at the same time.

We have mentioned a few of the infinite number of novelties that can be shot for diversion and amusement. Other writers have mentioned others. These, however, are but passing amusements and serve their purpose for the moment. But the real interest, the sustained interest in shooting with the bow-and-arrow, is based on standard target-practice; and this is, in turn, based on the York and American Rounds.

CHAPTER XXXIV

CLOUT-SHOOTING

Clout-shooting is one of the most interesting of archery diversions. It is akin to the "turtle-back" shooting of natives, or to modern howitzer shooting with high-angle guns.

In clout-shooting the targets are marks of various sizes and shapes laid flat on the ground. Sometimes the mark is raised at a slight angle to permit better visibility.

Clout-shooting is usually done from long ranges. It is particularly interesting to spectators because of the long, graceful flights of the arrows. But after a few ends it loses considerable charm for the archer—since he has to walk so far to retrieve his arrows. To eliminate part of this objection two clouts are generally used and shooting is done from both ends of the field.

With some old societies in England clout-shooting was the principal mode of shooting. A marker stood near the clout and signalled the result of each shot.

> Watching the arrow as it leaves the bow, he will stand his ground with marvellous firmness, and he then exercises his judgment in the mark which he accords; having first signalled short, over, or wide, each flap of his flag means a bow's length from the clout, four bows being the extreme distance marked. For half a bow he lays his napkin over his left arm, a "foot" is indicated by striking his foot, "thumbs" by the hands united over the head, and a clout sends him on his back as if shot. He indicates the first or nearest arrow by a flourish above his head, and the second by one knee high.
>
> Marking at the clouts is a work of some danger, and the difficulty of obtaining men competent to undertake it forms one of the drawbacks to clout-shooting, as, without a marker much of the value of practice is lost.

These clouts were straw targets, smaller than the usual target. They were painted white, with a black spot in the centre, and were set at an angle with the lower edge on the ground. Shooting was done from 180 to 240 yards.

A modern adaptation is to place two circles of beaver-board, painted white and having a large black centre for visibility at an angle on the ground. These may be at any distance apart, preferably over 180 yards for men. Each archer shoots three arrows. As the clout is seldom hit, the arrow nearest counts for five points, second arrow three points, and third arrow one point. Any determined number of points may be called "game," or a time limit may be set for ending the match. A hit in the clout scores ten.

This is similar to pitching horse-shoes.

Another variation that is proving popular as a diversion after regular target-practice is to lay two ordinary targets flat on the ground at the maximum distance reached by the archer using the weakest bow.

The scoring is as described before.

In this game the fellow with the weak bow, usually a poor archer, has a great advantage, since he seldom undershoots and cannot overshoot the mark. If a number of shooters play at the same target it is almost anybody's game.

THE CLOUT ROUND

A standard American clout game has been evolved by the National Archery Association that may be termed the "Clout Round."

A regulation-style target is laid out on the ground with the dimensions measured in *feet* rather than inches. Thus the Gold is a circle nine and three-fifths feet in diameter, the whole target being a forty-eight-foot circle.

A white marker is put up to mark the centre.

Thirty-six arrows are shot by each contestant, in regular fashion, and hits count, respectively, the same as at the standard target.

The circles are marked with white lime, or, better, white tape, such as is used to mark out tennis courts.

Men shoot from 180 yards and women from 120 yards.

As this "Clout Round" has been standardised we can soon begin to compile a comparison of scores.

Although this style of clout-shoot has been held at the last four National Tournaments, with the exception of that of 1926, when it was omitted on account of rain, different numbers of arrows or slightly different target dimensions were used. So the first "offi-

cial" records may be said to have been made at the 1928 Tournament at Rye, N. Y. Dr. Paul W. Crouch won the men's event with 34-200 and Mrs. J. S. Stevenson of Mt. Vernon, N. Y., won the ladies' event with 35-219. Pictures of the Ladies' "Clout Round" at this event are shown on *Plate* IV.

CHAPTER XXXV

ROVERS AND ARCHERY-GOLF

Rovers, or "Roving," is another mode of shooting with the bow-and-arrow.

Essentially this consists of shooting at casual marks encountered on a stroll over more or less open country. But the idea has been adapted to various games.

When hunters used the bow-and-arrow as important weapons they no doubt practised **Roving** in its true form, letting fly at casual inanimate marks. Thus, if one saw no game he at least gratified his desire to shoot at something—and gained experience and skill in estimating distances and in field-shooting, so that when proper targets did appear he was more apt to bring home food or game.

Military archers were encouraged and often compelled to shoot at marks placed at various distances.

An act passed in 1541, among other provisions, provided that "no one under twenty-four was allowed to shoot at a standing mark, except for rovers, and then they were to change places at each shot, under a penalty of fourpence a shot; while all above the age of twenty-four were forbidden to shoot at less than eleven-score yards, under penalty of 6*s.* 8*d.*"

This was to compel able-bodied men of military age to become proficient with the longbow, which accounts largely for the efficiency of the English armies of the middle ages.

Regular courses were laid out over varied ground, and the archers vied with one another in shooting their way around them.

This made a more or less interesting game of an irksome duty. It also gave military archers excellent practice in estimating and allowing for unmeasured ranges, so their shooting would be more effective in the face of an enemy that was advancing in line-of-battle.

PROBABLE ORIGIN OF GOLF

As the bow is conceded to be the ancestor of stringed musical instruments, archery can also be said to have been the ancestor of the popular modern game *Golf*.

Golf is certainly a direct descendant of the old game of roving.

Records as far back as 1590 tell us of the roving games of the Finsbury Archers. And it is certain that at that time those now ancient companies practised according to traditions and rules that were as far removed in origin from them as they themselves are from us.

A plan of the marks of the Finsbury Archers with the distances between them might easily be mistaken for a modern golf-links by the casual observer.

It has been said humorously, but not without a semblance of truth, that Golf was originated by a Scotchman who found it cheaper to substitute a crooked-stick and a thistle-ball for the bow-and-arrow; and far less expensive to dig holes in the ground than to erect suitable butts for targets!

ARCHERY-GOLF

Archery-Golf is a "new" game that is frequently invented!

The writer played it under that name, although more after the idea of roving at variously placed targets, in 1906. At that time Mr. Randolph Laughlin, a prominent attorney, imported a number of bows-and-arrows and targets for the purpose.

The targets were spaced at various distances about his spacious county estate near St. Louis and great fun was experienced in making the rounds.

I recollect the year by remembering that the National Amateur Athletic Union held the outdoor swimming championships at the lake on this estate at about that time.

Archery-Golf at the present time, though, really refers to a mixed competition between archers and golfers on the standard golf-links.

In 1925 the writer, with Mr. A. W. Lantz, another enthusiastic pioneer archer of St. Louis, played such a match against two professional golfers on the course of the Bellerive Country Club. It was our first attempt at this mixed competition, and the outcome was eagerly watched by newspaper camera-men and reporters.

The match was a tie, which brought us half a page in the Sunday papers and more challenges.

From these matches we developed a most satisfactory game.

RULES FOR ARCHERY-GOLF COMPETITION

The archer shot with any bow and any arrow he desired for each shot, shooting from where the arrow lay, except that, on the green, the point of the drawn arrow when "putting" should be behind the last point at which the point stuck in the ground.

The archer's "hole" was simply a target of cardboard, or disc, equal in diameter to the hole. This was placed hole-high and six feet to the left of the cup. It was mounted, in a slotted stick, three inches off the ground and could be turned to face the archer.

Placing the target thus brought the target on the green, but far enough away from the hole to eliminate puncturing the turf near the cup.

A mixed archery-golf match of this nature between contestants of about equal respective abilities makes a remarkably even and interesting competition so long as the archers shoot on strange ground. However, an able archer who took care to study the course and calibrate his drawing-lengths for predetermined flight distances, could make almost any hole in three and many in two with monotonous regularity.

Flight-arrows are used for "driving" and approaching. Ordinary target-arrows, fitted with long spiked points, are used for "putting." The latter stick in the ground when they hit, and are not apt to skid off fifty yards or so if the first shot at the target itself is a miss.

ROVING COURSES

Roving with the bow-and-arrow should prove a splendid substitute for golf in localities for which a well-cared-for golf-links is too expensive. Any large tract of fairly well cropped pasture land would serve for a splendid Roving Course.

Small targets or butts could be placed at different distances and be shot at until hit, or the archer might shoot an end of six arrows in competition with another, the arrow nearest the central objective to count for that particular target.

Eighteen small targets, like those used for archery-golf, could easily be staked out and a game of archery alone developed. Artificial hazards, such as crooked courses, narrow lanes, marked for penalties, and "water holes," could be included to simulate the hazards of golf.

These are only suggestions, but they serve to point the way for imaginative archers to develop interesting diversions adaptable to field use for the bow-and-arrow.

CHAPTER XXXVI

FLIGHT-SHOOTING

With Flight-Shooting the sole aim is to cover the greatest possible distance.

We read of superhuman flight-shooting by the ancients.

Shots a mile or so in length were common!

However, as with marvellous tales of ancient archery, we are skeptical.

The greatest flight-shot of authentic record was made in 1795 by Mamhoud Effendji, secretary of the Turkish embassy at London.

Using a strong Turkish composite bow and a short, light flight-arrow, which is believed to have been drawn *within* the bow—through an attachment that enabled the use of a long draw with a short arrow—he obtained a flight-shot of 482 yards.

This shot was done in the presence of members of the Royal Toxophilite Society and was carefully measured.

In 1914, at Le Touquet, France, Mr. Ingo Simon, using a similar bow of eighty-pounds draw and a Turkish flight-arrow, succeeded in sending the arrow for a distance of 462 yards, 9 inches—for the greatest flight of modern times. In making this shot, Mr. Simon used the thumb-ring and the oriental draw.

These remarkable flight-shots have been unapproached until within the last few months, when Prof. Chas. D. Curtis, Superintendent of Schools at Pembina, North Dakota, exceeded 400 yards for the first time in history with a wooden bow.

Until the last two years 300 yards was considered the outside limit for flight-shooting with a wooden bow, and all contenders for flight honours looked on this mark as their objective. This had been exceeded by several yards on more or less numerous occasions, but in round numbers that *was* considered the acme of flight-shooting ability.

For flight-shooting very strong bows and light arrows are necessary, though the limit can be reached for each.

The recoil speed of the bow's ends determines the initial velocity and hence the distance that the arrow will travel. Once this maximum possible speed has been approached and the greatest possible distance nearly attained, little more can be done to increase it. A stronger bow, measured simply by weight, after a limit has been reached, does not guarantee faster cast. But added weight if the bow be properly designed will cast a heavier arrow.

Exceedingly light arrows are a mistake, as the shaft must be bulky enough to withstand the shock of the bow without buckling and heavy enough to carry sufficient momentum to overcome head-resistance.

Those interested in this specialised branch of archery must be content to search for exceptional individual staves of extraordinary elastic qualities, and must construct bows and arrows with a clear understanding of mechanical efficiency and balance.

Above all they must be patient and willing to bear the expense or trouble of replacing numerous broken bows.

N. A. A. FLIGHT-SHOOT RECORDS

At the National Tournaments the first flight-shoot was won in 1882 by Mr. J. Wilkinson, Chicago, with a flight of 213 yards. This record has been steadily exceeded as follows:

		yards	inches
1885	W. P. Webb, Eaton, Ohio	234	..
1889	L. W. Maxon, Washington, D. C..	266	..
1890	L. W. Maxon, Washington, D. C..	268	18
1891	L. W. Maxon, Washington, D. C..	290	..
1924	Dr. Paul W. Crouch, Newton Center	293	
	* Prof. Charles D. Curtis	304	6¼
1925	* Dr. Paul W. Crouch, Newton Center	311	6
1926	* Prof. Charles D. Curtis	324	24
1927	S. F. Spencer, San Pedro, Cal.	294	10
1928	Howard Hill, Miami, Fla.	300	9

In the above column the asterisk (*) denotes records made with "Free Style" shooting.

Professor Chas. D. Curtis, who has for many years specialised in flight-shooting, broke his arm, and since 1923 has been unable

to draw a bow of more than moderate weight. To circumvent this difficulty he adopted the style of shooting shown in the photograph of him on *Plate* III.

Nothing in the rules prevented shooting in this manner, but to differentiate between flight-shots made in the orthodox manner and those made in unusual forms, two events were included in the subsequent flight-shoot programmes. Those shot in the regular manner were termed "Regular," those shot in any other manner were termed "Free Style." However, in either case the bow-and-arrow must be used legitimately within the well-understood if not accurately defined meaning.

In 1911 Dr. Crouch used a 150-pound yew bow strapped to his feet, and drew the string with both hands, after the style of Professor Curtis. This method makes stronger bows and longer arrows possible, and is the principal reason for separating the two events. However, Professor Curtis uses bows that are well within the ordinary drawing powers of a strong man.

At the Bryn Mawr tournament, 1926, George Phillips Bryant, former National Champion, using a short yew bow of about 55 pounds, made a flight-shot of 299 yards, 2 inches. This would have been a new record for Regular Style shooting, but Bryant was not a member of the association at the time, so the record could not be declared "official."

In the spring of 1927 Professor Curtis, using the same osage-orange bow that he used at Bryn Mawr several months before, made a new record for wooden bows. He sent an arrow for a measured distance of 366 yards and 23 inches. To quote Professor Curtis in regard to this flight:

> "Now it is no 'whale' of a bow and there were perhaps a dozen men at Bryn Mawr who could easily have drawn it to the tip of a flight arrow in the ordinary way. Of course I couldn't with my 'game' arm but you will know that it isn't so strong when I tell you that I can string it alone quite handily. But it sure has got a recoil to it that zips an arrow out through space wonderfully well. It is a homely bow to look at as it has a natural crook in the wrong direction near one end and a hump in the middle of the other limb. I made it from a stave that I had thrown away half a dozen times when looking my stock over for fine staves. Only took it this time in an emergency."

This remained the record flight ever made in this country—and the longest recorded flight ever made with a wooden bow, until

Howard Hill of Miami, Florida, at the first Annual Archery-Golf Tournament, at Opa-Locka, Florida, February 24-26, 1928, sent out an arrow for 391 yards and 23 inches.

This performance was witnessed by about fifty people and the correctness of the measurement was vouched for by competent judges. In making this record Mr. Hill used a 172-pound Osage bow, 5 feet long, and shot a 22-inch birch arrow.

This performance was made in the Regular Style of shooting.

A picture of Mr. Hill drawing this bow is shown on the *Frontispiece*. From its appearance it looks like a toy, yet the strain on Mr. Hill's fingers was over 150 pounds when this snap-shot was taken.

Mr. Hill shot this bow at the 1928 National Tournament but broke the string before any official record shots could be made. However, about an hour before the flight event Mr. Hill in practice sent repeated shots down the field for flights in excess of 340 yards. The writer was warming up for the afternoon shooting and watched these practice shots land.

Mr. Hill's record still remains the Regular Style record; but within the past two months Prof. Curtis has made some marvellous flight-shots, exceeding 400 yards for the first time in this country and breaking all previous records for shooting with a wooden bow. His record shot reached out for the amazing distance of 422 yards and 24 inches.

In the photograph of Prof. Curtis on *Plate* III, made on September 22nd, 1928, he is shown with a thirty-inch arrow at full draw. The flight from this loose took the arrow over 400 yards.

The following paragraphs are from letters to the present writer from Prof. Curtis, in regard to these remarkable shots:

> ". . . in regard to flight shooting. You asked me if I had made any better records than the 366 yards in flight shooting. I am pleased to report to you that I have and I am copying down a few lines from my diary that I keep in flight shooting experiments. Here is a leaf of my diary.
>
> 'Flight Records—Measured Distances'
>
> *'Sept. 15th, 1928*— 361 yards; 366 yards, 2 inches
> 366 yards, 8 inches
> *'Sept. 17th, 1928*— 380 yards, 20 inches
> *'Sept. 18th, 1928*— 377 yards 12 inches
>
> 'All above made with yew bow.

'*Sept. 22nd, 1928*—406 yards plus; 417 yards, 17 inches
417 yards, 8 inches; 422 yards, 24 inches

'All above made with osage bow.

'A few others were well over the 390-yard mark.

'(Copied from my notebook as written down at the time of shooting.)'

"I had witnesses to all these shots as well as witnesses who did the measuring. I have signed statements of six men who witnessed the shots and did the measuring and you may be sure they are absolutely reliable and correct. I myself also measured them with my boy helping me and in all the measuring done there was a variation of but two inches. Two men got 422 yards 26 inches but I have given the lesser one of 422 yards 24 inches.

". . . of course as you know I have a crippled arm which prohibits shooting a bow of over sixty pounds in the ordinary way, so I resort to a method the Sac and Fox Indians taught me when a boy, which we now term 'free style.' But I also wish to state that the bows with which I made these records are not nearly so strong as Mr. Hill's 172-lb. osage which he is strong enough to pull in the ordinary way. I have never weighed my bows but I should imagine they are about seventy-five pounds weaker than Mr. Hill's 172-pounder. Anyway I can string my bows in the ordinary way and also unstring them and am no physical giant by any means. I imagine they pull right around a hundred pounds.

"I am experimenting with yew and osage to try to find out which is the better for flight shooting. I believe there isn't much difference. Some days my yew outshoots the osage and vice versa. I believe as Mr. James Duff does in regard to flight bows, *viz.*, that after they have been shot a few dozen times they begin to lost cast, especially the more bulky hundred-pound bows, and above. The fibre of the wood seems to set, or deaden, or something, that makes it lose its resiliency. . . .

"Now as to the arrows, will say that I have about two dozen flight arrows that are all good fliers; of course I have many more that are not so good too. But my best arrows and the ones with which I made my 400-yard distances were just the common run of flight arrows. Some were Port Orford cedar, some were Douglas fir, some Norway pine. Some were footed with hard wood and some were not footed at all. They ran in length from twenty-nine inches to thirty inches, none under twenty-nine and none over thirty.

"The weight of each arrow varied, there hardly being any two of the same weight, although they ran between nineteen grams (293 grains) and twenty-five grams (385 grains), which, of course, is quite a variation.

"The feathers are almost without exception turkey feathers trimmed

down smaller than target arrows but shaped very much like our target balloon feathers. In fact, they are practically the same thing but about half as large. I have tried many kinds of feathers and many shapes of feathers on my flight arrows but have settled down to the above after four or five years' steady experimenting.

"I have won three National flight trophies and won them all with bamboo arrows. But I have discarded the bamboo arrow now for the spruce, fir and Port Orford cedar. . . .

"For piles I use .25 calibre metal bullet jackets.

"There is little choice in my collection of flight arrows, that is, the two dozen spoken of above. You could shut your eyes and pull out three at random and be sure of getting three number-one fliers. The arrow that I sent 422 yards was a spruce, thirty inches long, footed with hard wood, weighs 22.5 grams (347 grains) with a .25 bullet jacket for a pile and an aluminum nock, feathered with a wild goose's wing-feathers, which same goose was shot within a mile of Pembina. . . .

"But I sent two other arrows over 417 yards that same afternoon which were along the same lines, except one was P. O. cedar and the other Norway pine.

"On that afternoon there was a fair wind and I did my best to shoot directly with it. It was just about the same wind we encounter at our tournaments. Now right here I wish to write a few lines concerning the effect of wind upon flight shooting.

"As for me, give me absolute calm. That is, of course, hard to do since there is nearly always some breeze stirring around. But I have run across several such days. In five years' experimenting I have proven, in my case at least, that a real strong wind is a hindrance. You cannot shoot an arrow into the air in a strong wind even right down wind and have it fly true. It will drift sidewise in spite of your best efforts, and a side-drift will take off many yards.

"I have shot up here often in virtual gales when one would expect an arrow to go about a half-mile but I have never yet made 300 yards in a high wind. . . .

"If you can hold your arrow steady and true the real small surface of the feather-end, presented to the wind, isn't going to be affected much by it. But as stated above I have yet to see the archer who could keep his arrow from side-drifting in a strong or high wind. And a side-drift has exactly the same effect as shooting quartering into the wind, a condition which all flight shooters dread to contend with.

"A flirting arrow is an abomination to flight shooters, and it is one of my worst enemies, either regular style or free style. So I have paid lots of attention this fall to details in order to get a smooth release and even flight. This is harder to do when shooting 'free style,'

as I do, than when shooting regular. But I am gradually overcoming difficulties and believe I can get at least one arrow out of three away without any flirting. Sometimes I can get three away in succession that way and once in my life, September 22nd, this fall, I got four in succession away that way and had the great satisfaction of seeing each arrow make better than 400 yards. . . .

"Oh, yes, about the length of my bows: the yew is five feet six inches, and the osage five feet four inches. Both stand the full draw of a thirty-inch arrow. Pretty fierce punishment, too, I say. No wonder I break so many."

SHOOTING FOR HEIGHT

No accurate measurements in regard to possible vertical heights attainable with an arrow are available. However, on September 3rd, 1926, the writer made a semi-official test to ascertain some idea as to this figure.

With the Washington Monument as a most imposing standard for comparison, numerous arrows were shot vertically upward.

An observer from the Smithsonian Institute, Mr. Paul E. Garber, watched the flights and recorded the crest of each against the background formed by the distant monument, the point of observation being several hundred yards away.

From a fairly accurate method of triangulation it was found that the maximum height attained was 375 feet. This was done with the forty-eight-pound yew bow pictured in the writer's hands on *Plate* I. Light target-arrows were used. A snap-shot of this test appears in the centre of *Plate* I.

With a strong flight-bow and special flight-arrows, an additional 100 feet ought to be attained. But the monument itself, rising 555 feet into the air, will probably never be entirely cleared by an arrow shot from a bow.

CHAPTER XXXVII

SCORES

Climbing the ladder of scores furnishes an archer with the greatest incentive to improve his game. And in no other sport or pastime can comparison between different individuals be so accurately gauged as in archery.

Since 1844, when the first Grand National Archery Meeting was held at Knavesmire, near York, we have complete summaries of the scores. Likewise, we have an accurate and complete record of American scores, made at the National Tournaments in the United States since its first meeting in 1879.

Other records also exist, some far antedating those of the two important annual meetings just mentioned.

The bibliography of this volume gives sources for obtaining these records and many others.

We have no room herein to duplicate such lists.

Dr. Elmer's *Archery* should be consulted for authentic records prior to its publication in 1926.

But, to give the novice some idea of where he stands after his first score is turned in for the various important rounds, and to give him some incentive to keep climbing, we publish in this chapter the best scores made in the United States, at the most important rounds, reported by individual archers from all parts of the country, for 1927.

We are indebted to Mr. Louis C. Smith, Secretary-Treasurer of the National Archery Association of the United States, for these scores. They are here taken from "Bulletin 112," March 1, 1928, the official organ of the National Archery Association.

Each score represents the archer's best score for the year at the respective round.

MEN'S SCORES

SINGLE YORK ROUND

N. A. A. Record	Harry B. Richardson (1910)	116-566
E. A. A. Record	P. W. Crouch (1927)	113-589
Private Practice Record	P. W. Crouch (1925)	132-732

(Scores above 500)

	H. S.		H. S.
P. W. Crouch, Newton Center	126-694	Gen. I. Thord-Gray, Gr'nwich	116-566
A. W. Lambert, Jr., St. Louis, Mo.	122-644	Mike Demaris, S'a M'ica, Cal.	98-508
S. F. Spencer, San Pedro, Cal.	126-628	C. Yeaman, Los Angeles, Cal.	106-506
A. L. Brush, Cos Cob, Conn.	117-579	L. Yeaman, Los Angeles, Cal.	104-506

(Scores between 400 and 500)

A. W. Dick, Worcester, N. Y.	94-476	H. Carter, Santa Monica, Cal.	96-442
F. H. Kenagy, Rupert, Idaho	103-473	J. Plowe, Hollywood, Cal.	97-427
P. Dugan, Los Angeles, Cal.	101-467	R. P. Elmer, Wayne, Pa.	98-414
Art Young, Beverly Hills, Cal.	99-467	F. W. Mosher, Gr. Rapids, Mich.	89-411
W. H. Palmer, Wayne, Pa.	99-461	G. A. Mang, Scarsdale, N. Y.	91-409

(Scores between 300 and 400)

J. S. Jiles, Pittsburgh, Pa.	90-398	C. Hyatt, Scarsdale, N. Y.	74-364
W. C. White, Scarsdale, N. Y.	97-397	E. Slana, Santa Monica, Cal.	80-340
S. Robertson, Greensboro, N. C.	86-396	D. Mackenzie, Greenwich, Conn.	88-332
E. Austin, Hollywood, Cal.	83-383	J. Nield, Greenfield, Mass.	73-331
H. Hourdequin, Avondale, Pa.	89-373	C. H. Styles, Los Gatos, Cal.	70-310
E. Mead, Cleveland Heights, O.	86-372	H. Crowell, Avondale, Pa.	69-307
C. Douglas, Los Angeles, Cal.	86-368		

(Scores between 200 and 300)

J. Geeslin, Greensboro, N. C.	79-299	A. Woodard, Greenfield, Mass.	52-244
P. Rounsevelle, Pinehurst, N. C.	69-293	C. Hungerford, East Haddam, Ct.	59-241
T. Merriman, New York City	68-292	B. Thompson, Corvallis, Ore.	66-240
C. Waggoner, Santa Monica, Cal.	69-289	R. Hodgson, San Pedro, Cal.	63-239
F. Syphert, Syracuse, N. Y.	65-289	J. Van Orden, Spring Valley	56-238
V. O'Davoren, Los Angeles, Cal.	62-282	M. Merriman, New York City	58-232
H. S. Taylor, Greenfield, Mass.	74-280	G. Dean, Buffalo, N. Y.	50-232
C. E. Dallin, Arlington, Mass.	70-280	N. Owen, Scarsdale, N. Y.	55-231
S. Stevens, Natick, Mass.	69-275	J. Dennison, Seattle, Wash.	48-228
H. Rohm, Pinehurst, N. C.	67-273	F. Vaughan, Los Angeles, Cal.	60-226
R. Barrow, Jersey City, N. J.	75-265	E. Wilson, Santa Monica, Cal.	60-224
J. Marye, Santa Monica, Cal.	65-265	W. Robinson, Washington, D. C.	52-224
A. Shepardson, Melrose, Mass.	66-262	A. P. Knight, Rome, N. Y.	53-223
E. Thord-Gray, Gr'nwich, Conn.	62-256	J. Kerchen, Seattle, Wash.	57-221
J. Barrow, Jersey City, N. J.	55-253	H. Eggleston, Albany, N. Y.	60-220
J. Carlson, Los Angeles, Cal.	57-251	K. Duryee, Seattle, Wash.	58-208
L. C. Smith, Newton Center, Mass.	60-250	P. Clancy, Santa Monica, Cal.	59-207
C. Seay, Los Angeles, Cal.	50-250	E. Grubbs, Los Angeles, Cal.	50-206
E. Frentz, Melrose, Mass.	57-249	J. Adams, Seattle, Wash.	44-204
H. Bailey, Los Angeles, Cal.	68-248	J. Doughty, Sedro Wooley, Wash.	55-203

(Scores between 100 and 200)

	H. S.		H. S.
J. Rundel, Mount Vernon, N. Y..	52-198	G. McClure, Buffalo, N. Y.	41-143
J. Stephenson, Mt. Vernon, N. Y.	54-192	R. Bradley, Snohomish, Wash. ..	34-142
C. Brownell, Moodus, Conn.	52-192	R. Churchill, Melrose, Mass.	32-142
H. Walker, Chicago, Ill.	53-191	E. Slama, Los Angeles, Cal.	39-141
C. B. Smith, Syracuse, N. Y.	44-186	A. Ely, New York	35-141
J. Berry, Corvallis, Ore.	49-179	Chief Crazy Bull, South Dakota	37-137
W. Lynch, Greenwich, Conn.....	57-177	G. Woolley, Newton Highlands.	42-136
O. Rice, Orlando, Fla.	47-177	F. Mooney, Seattle, Wash.	38-136
G. Gathey, Portland, Ore.	48-174	C. Smith, Syracuse, N. Y.	32-136
R. Thurwachter, Syracuse, N. Y.	43-169	O. Wood, Lynn, Mass.	30-136
H. Prouty, Portland Ore.	38-168	R. West, Seattle, Wash.	32-126
K. Stockton, Snohomish, Wash...	39-167	P. Ball, Deerfield, Mass.	29-123
W. Burr, Seattle, Wash.	41-165	D. Black, Pinehurst, N. C.	36-120
J. P. True, Waban, Mass.	48-164	F. Mills, New York	33-117
A. Wyman, Santa Monica, Cal...	45-161	G. Nichols, Bridgeport, Conn. ..	28-112
H. Kahler, Pinehurst, N. C.	33-149	J. Pfleuger, Seattle, Wash.	26-112
E. I. Cole, Ossining, N. Y.	31-149	M. Van Fleet, Los Angeles, Cal..	35-111
J. Heim, Albany, N. Y.	44-148	L. Carey, Los Angeles, Cal.	30-110
N. Williams, Albany, N. Y.	41-147	C. Ryan, Buffalo, N. Y.	32-108
		Cmdr. de Marbois, Toronto	27-101

SINGLE AMERICAN ROUND

N. A. A. Record .....P. W. Crouch (1925)	90-626
E. A. A. Record .....P. W. Crouch (1927)	90-620
Private Practice Record .....P. W. Crouch (1925)	90-684
C. Yeaman (1928)	90-684

(Scores above 600)

C. Yeaman, Los Angeles, Cal. ..	90-684	A. L. Brush, Cos Cob, Conn.	90-612
P. W. Crouch, Newton Center..	90-664	J. Boucot, Jersey City, N. J.	90-612
S. F. Spencer, San Pedro, Cal. ..	90-650	J. Plowe, Hollywood, Cal.	90-610
P. K. Dugan, Los Angeles, Cal.	90-631	L. Yeaman, Los Angeles, Cal. ..	90-602
A. W. Lambert, Jr., St. Louis ...	90-630		

(Scores between 500 and 600)

M. Demaris, Santa Monica, Cal.	88-596	J. Plowe, Hollywood, Cal.	90-562
E. Mead, Cleveland Heights, O..	90-594	S. Robertson, Greensboro, N. C..	88-562
W. H. Palmer, Wayne, Pa.	89-587	A. Young, Beverly Hills, Cal. ..	89-559
Mrs. E. Rounsevelle, Pinehurst..	90-584	W. White, Scarsdale, N. Y.	86-554
R. P. Elmer, Wayne, Pa.	90-580	F. H. Syphert, Syracuse, N. Y. ..	88-546
W. Lynch, Greenwich, Conn. ...	90-578	H. Moffet, Warrenton, Va.	86-538
F. Kenagy, Rupert, Idaho	90-574	Mrs. N. C. Owen, Scarsdale, N.Y.	90-536
E. Austin, Hollywood, Cal.	88-572	H. Carter, Santa Monica, Cal. ..	88-536
C. Douglas, Los Angeles, Cal. ..	88-572	A. Tuttle, St. Petersburg, Fla. ..	86-536
Gen. I. Thord-Gray, Greenwich	88-568	C. D. Curtis, Pembina, N. D. ...	89-535
B. Rawlins, Chicago, Ill.	87-567	T. Merriman, New York City ..	87-523
A. Dick, Worcester, Mass.	88-566	A. Shepardson, Melrose, Mass...	86-520
Mrs. R. Hodgson, San Pedro, Cal.	90-564	F. Vaughan, Los Angeles, Cal. ..	85-515
C. Woodhouse, Kansas City, Mo.	90-562	J. Nield, Greenfield, Mass.	88-508

	H. S.		H. S.
F. Mosher, Grand Rapids, Mich.	86-508	G. W. Guyer, Rome, N. Y.	89-503
G. Mang, Scarsdale, N. Y.	85-507	P. Rousevelle, Pinehurst, N. C..	87-503
J. Griffith, Savannah, Ga.	-505	A. P. Knight, Rome, N. Y.	84-500
G. Dean, Buffalo, N. Y.	88-504		

(*Scores between 400 and 500*)

D. Mackenzie, Greenwich, Conn.	88-498	F. Guy, Ossining, N. Y.	81-433
H. Hourdequin, Avondale, Pa. ..	85-495	H. Crowell, Avondale, Pa.	84-431
W. Dolman, Oakland, Cal.	84-494	E. I. Cole, Ossining, N. Y.	81-431
F. Brown, Peoria, Ill.	87-491	J. Barrett, Modesto, Cal.	82-430
C. Shabtac, Buffalo, N. Y.	87-487	H. Bean, Boston, Mass.	77-429
J. Blake, St. Petersburg, Fla. ...	86-484	J. Jiles, Pittsburgh, Pa.	84-428
Mrs. D. Cummings, Brookdale..	81-481	D. Rogers, Boston, Mass.	84-428
P. Clancy, Santa Monica, Cal...	83-479	J. Marye, Santa Monica, Cal. ..	80-428
C. Seay, Los Angeles, Cal.	84-474	C. Chase, Oakland, Cal.	83-427
R. Willcox, S. Egremont, Mass..	83-473	L. C. Smith, Newton Center, Mass.	84-424
E. Thord-Gray, Gr'nwich, Conn.	86-472	A. Woodard, Greenfield, Mass.	80-424
E. Jones, Chicago, Ill.	79-469	H. L. Lake, Fulton, N. Y.	79-423
C. Hyatt, Scarsdale, N. Y.	84-468	J. Tomassetti, Scotch Plains, N.J.	80-422
E. Slama, Santa Monica, Cal. ..	82-466	W. Hurd, Oakland, Cal.	77-421
M. Merriman, New York City ..	80-460	Jack Guyer, Rome, N. Y.	74-420
G. McClure, Buffalo, N. Y.	84-458	C. H. Styles, Los Gatos, Cal. ...	86-418
C. Brownell, Moodus, Conn.	82-456	Mrs. H. Bartholomaei, Waban ..	78-418
N. C. Owen, Scarsdale, N. Y. ..	85-455	H. Walker, Chicago, Ill.	76-416
C. Waggoner, Santa Monica, Cal.	84-454	J. Kerchen, Seattle, Wash.	80-410
S. Stevens, Natick, Mass.	84-450	McC. Gregory, Oakland, Cal. ...	76-410
H. S. Taylor, Greenfield, Mass...	87-449	L. Cram, Newtonville, Mass. ..	77-409
V. O'Davoren, Los Angeles, Cal.	84-448	J. Randell, Mount Vernon, N. Y.	80-408
L. Cutten, Allentown, Pa.	84-448	C. Boley, Berwyn, Ill.	78-408
C. Hutchinson, Oakland, Cal. ...	78-448	J. Barrow, Jersey City, N. J. ...	78-406
G. Eisenbrand, Wilmette, Ill. ...	84-446	R. Churchill, Melrose, Mass. ...	81-405
L. Webb, Los Angeles, Cal.	80-446	S. Douglas, V., Greensboro, N. C.	81-405
J. Geeslin, Greensboro, N. C. ...	85-443	V. Baird, Modesto, Cal.	80-404
W. Giffing, Scarsdale, N. Y.	79-443	H. Clarke, Modesto, Cal.	76-404
J. Carlson, Los Angeles, Cal. ...	83-437	C. Dallin, Arlington, Mass.	80-400
E. Eichorn, Scotch Plains, N. J...	84-436	B. Gregory, Savannah, Ga.	78-400
J. Van Orden, Spring Valley ...	82-434		

(*Scores between 300 and 400*)

A. Ely New York	76-396	R. Barrow, Jersey City, N. J. ...	78-386
C. Smith, Syracuse, N. Y.	79-395	D. Gardner, Scotch Plains, N. J.	81-385
H. Rohm, Pinehurst, N. C.	77-395	R. West, Seattle, Wash.	78-380
W. McPherson, Boston, Mass. ..	75-393	J. Adams, Seattle, Wash.	78-380
J. B. True, Wauban, Mass.	75-393	William Peck, Peoria, Ill.	79-379
Miss C. Wesson, Cotuit, Mass. ..	79-391	C. Hungerford, E. Haddam, Ct.	71-377
E. Frentz, Melrose, Mass.	77-391	O. Rice, Orlando, Fla.	71-377
C. Clippinger, Rome, N. Y.	82-390	B. Hutchinson, Orlando, Fla. ...	73-371
J. Stevenson, Mt. Vernon, N. Y.	74-390	H. Bailey, Riverdale, Cal.	76-370
N. Williams, Albany, N. Y.	75-389	E. Grubbs, Los Angeles, Cal. ...	74-370
H. Eggleston, Albany, N. Y. ...	76-388	Mrs. T. Merriman, New York..	70-370
S. Perrino, Oakland, Cal.	79-387	W. Gere, Syracuse, N. Y.	82-368

	H.	S.
S. Coffin, St. Louis, Mo.	71	367
R. Brissman, St. Paul, Minn.	78	364
S. Jessup, Oakland, Cal.	79	363
J. Doughty, Sedro Wooley, Wash.	74	354
J. Whitsel, St. Louis, Mo.	69	353
E. Donovan, Chicago, Ill.	75	351
W. Flosse, Cleveland Heights, O.	69	351
E. Wilson, Santa Monica, Cal.	66	350
L. Pangborn, Chicago, Ill.	79	349
E. Powell, Port Angeles	75	349
Miss F. Thord-Gray, Greenwich	70	348
W. Henn, Santa Monica, Cal.	75	347
Miss S. Ives, Boston, Mass,	69	347
Miss C. Shepardson, Melrose	78	344
R. Bradley, Snohomish, Wash.	70	344
M. Van Fleet, Los Angeles, Cal.	81	339
F. Warner, Springfield, Mass.	67	339
A. Schurman, Seattle, Wash.	65	339
L. Carey	70	338
W. Burr, Seattle, Wash.	69	337
C. B. Smith, Syracuse, N. Y.	73	335
R. Thornberg, Oakland, Cal.	66	334
W. Bauer, Centralia, Ill.	67	333
G. C. Wooley, Newton Highlands	77	331
F. Clark, Chicago, Ill.	69	329
J. Hargrove, St. Paul, Minn.	72	326
H. Rogers, Chicago, Ill.	63	325
K. Duryee, Seattle, Wash.	71	323
Mrs. L. C. Smith, Newton Center	68	318
H. McChesney, Minneapolis	69	317
S. Doering, St. Louis, Mo.	61	317
M. Schrock, Modesto, Cal.	68	316
J. Dennison, Seattle, Wash.	68	314
H. Cummings, Brookline, Mass.	67	313
P. Tomasetti, Scotch Plains, N. J.	70	312
E. Carlson, Los Angeles, Cal.	62	312
M. Smith, Oakland, Cal.	70	310
G. Davis, Rome, N. Y.	62	310
A. Downing, Modesto, Cal.	60	307
B. Thompson, Corvallis, Ore.	69	307
R. Parrish, Savannah, Ga.	69	305
M. Botts, Chicago, Ill.	67	305
A. Young, St. Petersburg, Fla.	64	304
A. Wyman, Santa Monica, Cal.	62	304
W. Robinson, Washington, D.C.	69	303
W. Burgess, Berkeley, Cal.		-302
Dr. G. Cathey, Portland, Ore.	67	301
H. Kennington, Boston, Mass.	65	301
F. Leport, Kansas City, Mo.	61	301

SINGLE METROPOLITAN ROUND—MEN

Record Tournament Score ....P. W. Crouch (1927) 134-810
Record Practice Score .....P. W. Crouch (1926) 148-932

(Scores above 600)

A. W. Lambert, Jr., St. Louis, Mo.	130-814	A. Dick, Worcester, Mass.	121-701
P. W. Crouch, Newton Center	134-810	F. Syphert, Syracuse, N. Y.	117-633
W. H. Palmer, Wayne, Pa.	132-808	C. Woodhouse, Kansas City, Mo.	113-619
Gen. I. Thord-Gray, Greenwich	133-785	A. Tuttle, St. Petersburg, Fla.	114-612
A. L. Brush, CosCob, Conn.	127-741	R. P. Elmer, Wayne, Pa.	114-600

(Scores between 500 and 600)

D. Mackenzie, Greenwich, Conn.	118-598	C. Hyatt, Scarsdale, N. Y.	119-541
W. C. White, Scarsdale, N. Y.	106-598	A. Shepardson, Melrose, Mass.	107-523
C. E. Dallin, Arlington, Mass.	104-584	W. Dolman, Oakland, Cal.	109-521
G. Eisenbrand, Wilmette, Ill.	107-583	C. Kear, Bridgeport, Conn.	105-521
G. Mang, Scarsdale, N. Y.	111-581	C. Hutchinson, Oakland, Cal.	95-515
F. Harrington, Scarsdale, N. Y.	104-554	R. Churchill, Melrose, Mass.	107-513
J. Nield, Greenfield, Mass.	105-553	W. Hurd, Oakland, Cal.	103-511
T. Merriman, New York City	100-552	L. Stemmler, Brooklyn, N. Y.	101-507

(Scores between 400 and 500)

McC. Gregory, Oakland, Cal.	94-488	J. Boucot, Jersey City, N .J.	100-456
L. C. Smith, Newton Center, Mass.	92-478	C. Chase, Oakland, Cal.	99-447
R. Barrow, Jersey City, N. J.	102-470	J. Stevenson, Mt. Vernon, N. Y.	101-455
J. Jessup, Oakland, Cal.	96-470	J. Van Orden, Spring Valley	83-461

	H.	S.		H.	S.
N. C. Owen, Scarsdale, N. Y. ...	97-	447	J. P. True, Waban, Mass.	91-	425
A. Knight, Rome, N. Y.	96-	462	W. Gere, Syracuse, N. Y.	99-	415
W. Griffing, New Rochelle, N. Y.	94-	442	H. L. Lake, Fulton, N. Y.	94-	412
C. Smith, Syracuse, N. Y.	90-	442	S. Stevens, Natick, Mass.	88-	410
H. Thurwachter, Syracuse, N. Y.	84-	436	A. Baker, Boston, Mass.	93-	409
J. Barrow, Jersey City, N. J. ...	92-	434	W. McPherson, Boston, Mass. ..	79-	405

(Scores between 300 and 400)

G. Haynes, New York	79-	389	F. Pelham, New Rochelle, N. Y..	84-	348
Miss S. Ives, Boston, Mass.	72-	388	E. Thord-Gray, Greenwich ...	88-	340
R. Thornberg, Oakland, Cal. ...	81-	387	H. Bean, Boston, Mass.	82-	338
E. Frentz, Melrose, Mass.	92-	380	R. Woodruss, Oakland, Cal. ...	76-	334
H. Kennington, Boston, Mass. ...	83-	377	G. Green, Kansas City, Mo.	69-	333
H. Hubbell, New Rochelle, N. Y.	78-	370	F. Cook, Oakland, Cal.	81-	329
M. Smith, Oakland, Cal.	83-	359	H. Cummings, Brookline, Mass..	72-	322
			J. Cosseboom, Woonsocket, Mass.	65-	315

(Scores below 300)

W. Burgess, Berkeley, Cal.	59-	281	P. Williams, Newton C't'r, Mass.	55-	203
G. Smith, New York	50-	260	J. Kimball, Haverhill, Pa.	44-	202
H. A. Ives, Boston, Mass.	61-	255	C. Norton, New Bedford, Mass..	51-	199
A. Chadbourne, New York	52-	252	W. Crofoot, Syracuse, N. Y.	50-	198
G. Davis, Rome, N. Y.	59-	239	J. Santry, Lynn, Mass.	45-	183
A. Beling, Harrington Park	56-	238	J. Randell, Mount Vernon, N. Y.	41-	161
R. Kelly, Marrimac, Mass.	56-	238	J. Messing, St. Louis, Mo.	38-	150
P. Gordon	53-	235	H. Spooner, St. Louis, Mo.	37-	135
R. Lagai, Brooklyn, N. Y.	56-	232	P. Cahonet, Cohasset	49-	121
J. Jansen, New York	59-	227	P. Hensen, Lynn, Mass.	25-	99
P. Ball, Deerfield, Mass.	49-	217	F. Jordan, Newton Highlands ..	30-	80
J. H. Curd, Webster Groves, Mo.	52-	212	H. Kudlich, Dedham, Mass. ...	23-	77
P. Ripley, Newton, Mass.	56-	210			

LADIES' SCORES

SINGLE NATIONAL ROUND

N. A. A. Record	Mrs. M. C. Howell (1895)	68-398
E. A. A. Record	Mrs. Dorothy Smith Cummings ('23)	63-343
Private Practice Record	Miss Cynthia Wesson (1916)	71-485

(Scores over 300)

Miss J. Akester, Chicago, Ill. ...	67-	381	Mrs. C. Owen, Scarsdale, N. Y.	66-	332
Mrs. R. Johnson, Los Angeles..	65-	365	Mrs. V. Carter, Santa Monica ..	64-	328
Mrs. D. Cummings, Newton Center	67-	339	Mrs. E. Rounsevelle, Pinehurst..	62-	328
			Mrs. R. Hodgson, San Pedro ..	63-	307

(Scores between 200 and 300)

Mrs. H. Raymond, Los Angeles.	64-	292	Mrs. E. Curd, Webster Groves, Mo.	54-	258
Miss F. Thord-Gray, Greenwich	56-	262	Miss D. Johnston, Ormond B'ch	56-	248
Mrs. H. Green, Worcester, Mass.	56-	262			

	H.	S.		H.	S.
Mrs. C. Yeaman, Los Angeles..	52-	246	Miss G. Thomas, Ormond Be'ch	53-	223
Miss S. Ives, Boston, Mass.	55-	235	Mrs. H. Bartholomai, Waban ..	48-	214
Miss C. Wesson, Cambridge, Mass.	53-	235	Miss R. Brewer, Newton Center	47-	209
Mrs. L. C. Smith, Newton Center	55-	233	Miss C. Shepardson, Melrose...	42-	208
			Miss E. White, Scarsdale, N. Y.	42-	208
			Miss E. Strasser, Los Angeles..	50-	202

(*Scores between 100 and 200*)

Miss R. Mackenzie, Greenwich..	47-	195	Mrs. A. Dick, Worcester, Mass.	32-	126
Mrs. C. Herron, Chicago, Ill. ...	43-	193	Miss D. Douglas, Los Angeles	32-	126
Miss M. Richards, Los Angeles..	49-	187	Mrs. B. P. Gray, Newton Center	35-	125
Edith Strasser, Los Angeles, Cal.	44-	176	Mrs. Douglass, High Point, N. C.	33-	125
Mrs. E. Grubbs, Los Angeles ..	39-	173	Miss F. Bowles, Pinehurst	37-	121
Miss A. Buxton, Springfield	38-	166	Miss M. Clancy, Santa Monica	29-	121
Mrs. F. Vaughn, Los Angeles ...	42-	164	Miss C. Payne, Greenfield, Mass.	27-	117
Miss V. Atmore, Wayne, Pa.	41-	157	Miss Bushong, Worcester, Mass.	27-	113
Mrs. G. McClure, Buffalo, N. Y.	35-	155	Miss L. Mills, Glen Ridge	21-	113
Mrs. J. P. True, Waban, Mass.	34-	152	Mrs. C. Seay, Los Angeles, Cal.	29-	111
Miss Mae Duff, Jersey City, N. J.	37-	149	Miss K. Marsh, Orm'd Beach..	21-	111
Miss E. True, Waban, Mass. ..	39-	147	Mrs. C. Reynolds, Chicago, Ill...	28-	110
Mrs. R. P. Elmer, Wayne, Pa.	31-	131	Miss C. Kingston, Sp'field.....	30-	108
Miss F. Hayward, Devon, Pa. ..	36-	130	Miss M. Tuck, Pawtucket, R. I..	30-	108
Mrs. C. Hyatt, Scarsdale, N. Y.	32-	130	Mrs. J. Nield, Greenfield, Mass.	26-	104
Mrs. F. Alderman, High Point ..	34-	128	Miss M. Glazer, Springfield....	23-	103

SINGLE COLUMBIA ROUND

N. A. A. Record	Miss Cynthia Wesson (1915)	72-510
E. A. A. Record	Mrs. Dorothy Cummings (1926)	71-455
Private Practice Record	Miss Cynthia Wesson (1915)	72-560

(*Scores over 400*)

Mrs. E. Rounsevelle, Pinehurst.	72-	506	Mrs. R. Hodgson, Los Angeles..	70-	434
Mrs. D. Cummings, Brookline ..	71-	489	Mrs. C. Owen, Scarsdale, N. Y..	67-	425
Miss J. Akester, Chicago, Ill. ...	68-	482	Miss J. Cheetham, Seattle, Wash.	67-	415
Mrs. R. Johnson, Alhambra, Cal.	72-	466	Mrs. V. Carter, Santa Monica ..	71-	403
Mrs. H. Raymond, Los Angeles..	70-	460			

(*Scores between 300 and 400*)

Mrs. L. C. Smith, Newton Center	68-	394	Miss Laskew, St. Petersburg, Fla.	62-	236
Miss F. Thord-Gray, Greenwich	69-	389	Mrs. Little, Los Angeles, Cal. ..	69-	333
Miss E. Strasser, Los Angeles ...	71-	383	Mrs. N. Bartholomaei, Waban..	64-	332
Miss C. Wesson, Cambridge, Mass.	66-	378	Miss E. White, Scarsdale, N. Y.	58-	332
Mrs. C. Yeaman, Los Angeles, Cal.	67-	359	Mrs. E. Curd, Webster Groves..	64-	330
			Miss M. Richards, Los Angeles..	64-	322
Miss E. Strasser, Los Angeles ...	63-	359	Miss D. Johnston, Ormond Beach	60-	320
Miss C. Shepardson, Melrose ...	69-	342	Mrs. C. Herron, Chicago, Ill.....	59-	315
Miss S. Ives, Boston, Mass.	64-	340	Miss E. True, Waban, Mass.	61-	309
			Miss M. Duff, Jersey City, N. J.	61-	301

(*Scores between 200 and 300*)

	H.	S.
Mrs. G. M. McClure, Buffalo, N. Y.	59	299
Miss R. Mackenzie, Greenwich	58	296
Mrs. F. Vaughan, Los Angeles	59	295
Miss G. Thomas, Ormond Beach	61	293
Miss A. Buxton, Springfield	58	292
Mrs. E. Grubbs, Los Angeles, Cal.	59	289
Miss V. Atmore, Wayne, Pa.	56	280
Miss L. Hibbard, Coventry, Conn.	54	272
Mrs. R. P. Elmer, Wayne, Pa.	56	264
Miss D. Douglas, Los Angeles	61	263
Mrs. H. Bailey, Elizabeth, N. J.	48	262
Miss F. Bowles, Pinehurst, N. C.	52	260
Mrs. C. Hyatt, Scarsdale, N. Y.	50	260
Miss F. Hayward, Devon, Pa.	53	259
Miss N. Knight, Rome, N. Y.	56	248
Mrs. H. Clarke, Modesto, Cal.	55	247
Mrs. C. Seay, Los Angeles, Cal.	56	246
Mrs. Pote, Syracuse, N. Y.	54	246
Miss M. Tuck, Pawtucket, R. I.	53	245
Mrs. F. Syphert, Syracuse, N. Y.	56	244
Miss P. Bushong, Worcester	52	240
Miss M. Patterson, Pinehurst	49	239
Miss C. Kingston, Springfield	52	238
Miss V. Douglass, Greensboro	51	237
Miss Marian Clancy, Santa M'ca	55	235
Mrs. L. Yeaman, Los Angeles	55	235
Mrs. J. Nield, Greenfield, Mass.	51	233
Mrs. B. Baldwin, Los Angeles	52	232
Mrs. Thorne-Smith, S. Plains	49	231
Miss R. Brewer, Newton Center	53	225
Mrs. R. West, Seattle, Wash.	43	221
Mrs. B. P. Gray, Newton Center	52	220
Mrs. J. P. True, Waban, Mass.	46	212
Mrs. G. Alderman, High Point	49	211
Miss Nina Maxseiner, Los Angeles, Cal.	46	206
Mrs. A. Dick, Worcester, Mass.	43	201

(*Scores between 100 and 200*)

Mrs. C. Reynolds, Chicago, Ill.	49	199
Miss M. Glaser, Springfield	48	198
Miss E. Stein, Chicago, Ill.	44	198
Miss L. Mills, Glen Ridge	47	197
Miss F. Donohue, Buffalo, N. Y.	45	183
Mrs. Vadeboncœur, Syracuse	42	178
Miss R. Havey, Boston, Mass.	39	173
Mrs. T. Merriman, New York	42	170
Miss D. Pease, Springfield, Mass.	39	165
Miss M. Williams, Albany, N. Y.	41	163
Mrs. Davidson, Scotch Plains	37	161
Mrs. E. Eichorn, Irvington	36	160
Mrs. J. Prinz, Scotch Plains	36	158
Miss K. Marsh, Ormond Beach	40	156
Mrs. H. Kahler, Pinehurst, N. C.	39	154
Miss C. Payne, Greenfield, Mass.	38	152
Miss I. Morres, Bath, Eng.	35	147
Mrs. A. Day, Ormond B'ch, Fla.	35	143
Mrs. C. Smith, Syracuse, N. Y.	31	133
Miss L. Kingsbury, Rockv's	32	132
Miss L. Elmer, Wayne, Pa.	38	120
Miss M. Furry, Seattle, Wash.	30	120
Mrs. D. Newman, Scotch Plains	37	115
Miss M. Rowan, Seattle, Wash.	25	115
Mrs. W. Ambruster, Scotch Pl'ns	31	113
Mrs. E. Salisbury, Ormond B'ch	33	111
Miss L. Brown, Peoria, Ill.	29	111
Mrs. A. Krumray, Santa Monica	25	109
Miss D. McManus, Seattle, Wash.	30	108
Miss M. House, Spr'gfield, Mass.	30	106
Miss L. Lushington, Seattle	28	104

SINGLE METROPOLITAN ROUND—LADIES

Record Tournament Score ....Mrs. Dorothy Smith Cummings (1926) 116-672

(*Scores over 500*)

Mrs. D. Cummings, Brookline	111	663
Mrs. L. C. Smith, Newton Center	104	602
Mrs. C. Owen, Scarsdale, N. Y.	108	572
Mrs. E. Rounsevelle, Pinehurst	103	559
Miss Mae Duff, Jersey City, N. J.	101	533
Mrs. N. Bartholomaei, Waban	97	541
Miss F. Thord-Gray, Greenwich	102	508

(*Scores between 400 and 500*)

	H. S.		H. S.
Miss S. Ives, Boston, Mass. ...	94-468	Miss R. Mackenzie, Greenwich..	84-446
Miss C. Shepardson, Melrose ...	96-452	Mrs. F. Harrington, Scarsdale ..	89-441

(*Scores between 300 and 400*)

Mrs. T. Merriman, New York ..	85-381	Mrs. C. Hyatt, Scarsdale, N. Y..	73-319
Mrs. B. P. Gray, Newton Center	79-363		

(*Scores below 300*)

Miss D. Zwieker, New Rochelle	71-283	Mrs. Walls, Melrose, Mass.	43-167
Miss R. Brewer, Newton Center.	61-255	Mrs. H. Creworth, Melrose	28- 98
Mrs. A. Dick, Worcester, Mass..	61-237	Mrs. Wakely, Melrose, Mass. ...	25- 97
Mrs. J. P. True, Waban, Mass...	58-226	Mrs. G. Haynes, New York	24- 82
Mrs. C. Norton, New Bedford..	38-172	Mrs. H. Bean, Boston, Mass.	24- 56
Mrs. G. Pelham, New Rochelle..	42-170	Mrs. R. Churchill, Melrose, Mass.	6- 24

TOURNAMENT SCORES

MEN

The following are the scores made by the ten leading archers in the Double York, American, National and Columbia Rounds at the 1928 National Tournament (48th) of the N. A. A., at Rye, New York, August 21-24, 1928.

MEN

Double York Round		*100 yards* H S	*80 yards* H S	*60 yards* H S	*Single* H S	*Double* H S
A. L. Brush,	1st	44-184	40-192	22-114	106-490	
CosCob, Conn.	2nd	54-214	41-193	22-132	117-539	223-1029
W. H. Palmer, Jr.	1st	50-240	46-184	24-126	120-550	-
Philadelphia, Pa.	2nd	34-142	41-187	24-142	99-471	219-1021
Dr. E. K. Roberts,	1st	45-179	43-191	24-140	112-510	
Ventura, California	2nd	37-159	44-206	23-117	104-482	216-992
A. W. Lambert, Jr.,	1st	40-160	33-153	20- 98	93-411	
St. Louis, Missouri	2nd	49-229	44-186	24-136	113-551	210-962
Dr. R. P. Elmer,	1st	45-197	38-136	22-104	105-437	
Wayne, Pa.	2nd	41-165	36-178	22-126	99-469	204-906
Dr. P. W. Crouch,	1st	45-171	38-166	21- 97	104-434	
Newton Center, Mass.	2nd	43-155	39-185	23-105	105-455	209-889
C. H. Styles,	1st	40-172	31-141	23- 99	94-412	
Los Gatos, Californa	2nd	42-156	40-196	22-114	104-456	198-878
Scott Robertson,	1st	34-156	34-176	18- 84	86-416	
Greensboro, N. C.	2nd	34-162	33-157	23-123	90-442	176-858
C. G. Thompson,	1st	31-139	38-166	23-155	92-460	
Canandaigua, N. Y.	2nd	31-123	32-146	23-127	86-396	178-856
Caleb Hyatt,	1st	31-123	37-169	23-109	91-401	
Scarsdale, N. Y.	2nd	39-151	40-120	24-132	103-409	194-810

Double American Round		*60 yards* H S	*50 yards* H S	*40 yards* H S	*Single* H S	*Double* H S
W. H. Palmer, Jr.,	1st	28-166	30-220	30-198	88-584	
Philadelphia, Pa.	2nd	30-188	30-206	30-212	90-606	178-1190
C. J. Speidel,	1st	29-177	30-198	30-236	89-611	
Rochester, N. Y.	2nd	27-151	30-194	30-228	87-573	176-1184
Dr. E. K. Roberts,	1st	30-162	30-206	30-232	90-600	
Ventura, California	2nd	30-170	30-206	30-206	90-582	180-1182
A. W. Lambert, Jr.,	1st	27-143	30-206	30-216	87-565	
St. Louis, Missouri	2nd	28-174	30-204	30-218	88-596	175-1161
Dr. R. P. Elmer,	1st	30-178	28-158	30-202	88-538	
Wayne, Pa.	2nd	29-173	30-200	30-202	84-575	177-1113
Dr. P. W. Crouch,	1st	27-123	27-165	29-219	83-507	
Newton Center, Mass.	2nd	29-163	30-202	30-224	89-584	172-1096
W. C. White,	1st	30-156	30-168	30-202	90-526	
Scarsdale, N. Y.	2nd	29-159	30-176	30-222	89-557	179-1083
C. G. Thompson,	1st	29-169	28-152	30-206	87-527	
Canandaigua, N. Y.	2nd	30-146	29-203	30-194	89-543	176-1070
A. W. Dick	1st	25-127	30-182	29-189	84-498	
Worcester, Mass.	2nd	28-176	28-172	30-182	86-530	170-1028
J. S. Jiles	1st	29-161	28-164	29-191	86-516	
Pittsburgh, Pa.	2nd	26-124	30-180	29-183	85-507	171-1023

LADIES

Double National Round		*60 yards* H S	*50 yards* H S	*Single* H S	*Double* H S
Mrs. Beatrice Hodgson	1st	43-203	24-124	67-327	
San Pedro, California	2nd	37-177	22-116	59-293	126-620
Mrs. George A. Smith,	1st	36-182	23-138	58-320	
New York, N. Y.	2nd	36-168	23- 99	59-267	117-587
Mrs. Caleb Hyatt,	1st	42-186	21-101	63-287	
Scarsdale, New York	2nd	35-165	22-108	57-273	120-560
Mrs. E. Rounsevelle,	1st	37-173	20- 92	57-265	
Pinehurst, North Carolina	2nd	37-161	23-129	60-290	117-555
Mrs. G. E. McClure,	1st	37-169	17- 77	54-246	
Buffalo, New York	2nd	40-172	21-103	61-275	115-521
Mrs. J. S. Stevenson,	1st	32-122	19- 93	51-215	
Mount Vernon, N. Y.	2nd	39-183	21-123	60-306	111-521
Mrs. Katherine Chapman	1st	38-170	19- 85	57-255	
Chicago, Illinois	2nd	33-137	19- 97	52-234	109-489
Miss Jessie Akester	1st	30-122	23-127	53-249	
Chicago, Illinois	2nd	32-154	17- 71	49-225	102-474

Mrs. J. H. Curd,	1st	36-138	23-111	59-249	
Webster Groves, Missouri	2nd	21-109	21- 99	42-204	101-204
Miss Olive Hearn,	1st	33-143	18- 86	51-229	
Scarsdale, New York	2nd	34-146	19- 77	53-223	104-452

Double Columbia Round		*50 yards* H S	*40 yards* H S	*30 yards* H S	*Single* H S	*Double* H S
Mrs. George A. Smith,	1st	24-152	24-142	24-162	72-450	
New York, N. Y.	2nd	22-110	24-128	24-162	70-400	142-856
Mrs. Beatrice Hodgson	1st	23-133	23-147	24-138	70-418	
San Pedro, Cal.	2nd	22-108	23-159	24-166	69-433	139-851
Mrs. Eliz. Rounsevelle,	1st	20-108	22-116	24-158	60-382	
Pinehurst, N. C.	2nd	23-121	23-129	24-176	70-426	136-808
Miss Marion Barber,	1st	20-118	23-111	24-148	67-377	
Bryn Mawr, Pa.	2nd	22-104	24-138	24-184	70-426	137-803
Mrs. Geo. E. McClure,	1st	24-124	24-152	23-143	71-419	
Buffalo, N. Y.	2nd	19- 81	24-138	23-157	66-376	137-795
Mrs. Caleb Hyatt,	1st	22-106	22-132	18- 98	62-336	
Scarsdale, N. Y.	2nd	24-114	22-152	23-143	69-409	131-745
Mrs. J. H. Curd,	1st	21- 95	21-109	24-150	66-354	
Webster Groves, Mo.	2nd	18- 92	21-117	24-168	63-377	129-731
Mrs. J. S. Stevenson,	1st	18- 78	21-103	23-145	62-326	
Mount Vernon, N. Y.	2nd	22-108	24-122	24-156	70-386	132-712
Mrs. K. H. Chapman,	1st	18- 96	21- 99	23-131	62-326	
Chicago, Ill.	2nd	24-124	22-114	22-144	68-382	130-708
Miss Stella M. Ives,	1st	23-125	24-118	24-134	71-377	
Boston, Mass.	2nd	19- 67	23-119	24-136	60-322	131-699

THE END

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